12-2005

Potential Effects of Aggressive Videogames on Young Adult's Behavior and Physiology

Smallwood

POTENTIAL EFFECTS OF AGGRESSIVE VIDEOGAMES ON YOUNG ADULT'S BEHAVIOR AND PHYSIOLOGY

by

Kent David Smallwood

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
December 2005

POTENTIAL EFFECTS OF AGGRESSIVE VIDEOGAMES ON YOUNG ADULT'S BEHAVIOR AND PHYSIOLOGY

Kent David Smallwood, M.A.

Western Michigan University, 2005

Each year, interactive technology becomes more and more advanced, offering more lifelike environments, immersive experiences, and realistic situations. Additionally, the videogame industry has over doubled in size in less than ten years, now rivaling the box office industry. However, technological advances have quickly outpaced our understanding of the effects of certain types of adult content on the game player. To date, the majority of the research on the topic was conducted before the games themselves were technologically advanced enough to draw meaningful conclusions; the few studies conducted in the last few years, while offering promising methodological advancements from previous work, still have several shortcomings, mostly in their choice of dependent measures. The purposes of the present investigation were to build off of the small research base related to effects of violent video games on behavior and physiology, as well as utilize several different types of dependent measures not used in other studies. Results demonstrated virtually no physiological, behavioral, or attitudinal difference between the group that played the nonviolent game, compared to the group that played the violent game. Implications of these findings, limitations, and suggestions for future research are discussed.

ACKNOWLEDGMENTS

I would first and foremost like to thank my advisor, Dr. R. Wayne Fuqua, for his active role in shaping both this paper and my career in general. I have been able to pursue many opportunities I never thought possible because of his assistance and continued allowance of my autonomy. I would also like to thank the members of my graduate committee, Dr. Scott Gaynor, Dr. Cynthia Pietras, and Dr. R. Wayne Fuqua, for reviewing my work, assisting me in brainstorming some dependent measures I otherwise would not have known about, and helping shape this paper into its final form.

I would like to thank Cathy Johnson at the Sindecuse Health Center on the campus of Western Michigan University, for allowing me to use at my convenience a very precise and portable digital blood pressure monitor. She was always willing to work around my schedule of running sessions, and for that I am very grateful.

I would also like to recognize my research assistant, Joseph C. Dagen. As an undergraduate research assistant, he went above and beyond the call of duty in terms of involvement, running sessions, recruiting participants, calling to schedule sessions, and even suggesting revisions to the protocol. Finally, thanks to my good friend Dawn Dore, for answering all my procrastination-fueled last second statistical questions.

Kent David Smallwood

TABLE OF CONTENTS

Table of Contents—Continued

Table of Contents—Continued

LIST OF TABLES

LIST OF FIGURES

Introduction

Topic Background

The penetration and subsequent saturation of mass media in our society is occurring at an unprecedented rate. As of 1998, 99.4% of American households owned a television (Andreasen, 2001). Accompanying this widespread consumer technological adoption has been an increase in research on the effects of television programming on the thoughts and behaviors of children and young adults. Huston and colleagues estimate that by the time an American child graduates from elementary school, he or she will have watched 8,000 murders and over 100,000 other assorted illegal acts on network television alone (Huston et al., 1992). The multitude of studies on this topic almost unanimously suggest some correlation between time spent watching violent acts on television, and subsequent aggressive behavior (see Paik & Comstock, 1994 for a review of this literature).

In contrast to the extensive research on televised violence, there is little research on the impact on behavior of video games with aggressive themes, or violent content (henceforth referred to as "violent video games"). The experience of playing video games differs sufficiently from the relatively passive viewing experience of television to raise concerns about extrapolating from the research on televised violence to the video gaming experience. Among other differences, video games force active role adoption and a constant stream of input from the user, as well as contingencies rewarding specific behaviors, often simulated acts of violence, in the game. It is crucial to qualitatively

differentiate this from television viewing, as this is a passive experience that does not require active participation or role adoption

Widespread public scrutiny of the content of videogames began in the early nineties, in the wake of congressional hearings on videogames such as “Mortal Kombat” (Cho, 2004) that featured lifelike violence on a scale not before seen in video games of any kind. Indirectly, these hearings lead to the formation of the Electronic Software Ratings Board, or ESRB, which is “a self-regulatory body for the interactive entertainment software industry…[that] independently applies and enforces ratings, advertising guidelines, and online privacy principles adopted by the computer and video game industry” (ESRB, 2005). The ESRB offers ratings for videogame products, and game publishers have volunteered to place said ratings on their product, although the system has several noticeable flaws, which will be discussed below.

Industry Scope

The videogame industry has increased exponentially in the last decade, transforming from a niche market that caters to a small group of avid gamers, to a legitimate media powerhouse rivaling the movie industry. For example, computer and video game software sales in the United States grew 4% in 2004 to $7.3 billion, which represents a doubling of industry software sales since 1996 (Entertainment Software Association, 2004). 248 million individual software titles were sold in 2004, an increase of almost 10 million units from 2003 (Winegarner, 2005). Besides sales within the industry, the publicity and subsequent sales of high profile games has permeated popular culture as a whole. For example, “Halo 2,” sold 2.38 million units in the first 24 hours

the game was available, generating more revenue in 24 hours than day one sales of any full feature movie in entertainment history, including Spider Man 2, Matrix: Reloaded and Harry Potter and the Prisoner of Azkaban (Hep, 2004). Clearly, videogames are on the rise in popular culture and seem poised to become more popular across a wider demographic each year. Figure 1, from data published by the Entertainment Software Association (ESA), the main trade organization for the industry, shows annual industry sales since 1996.

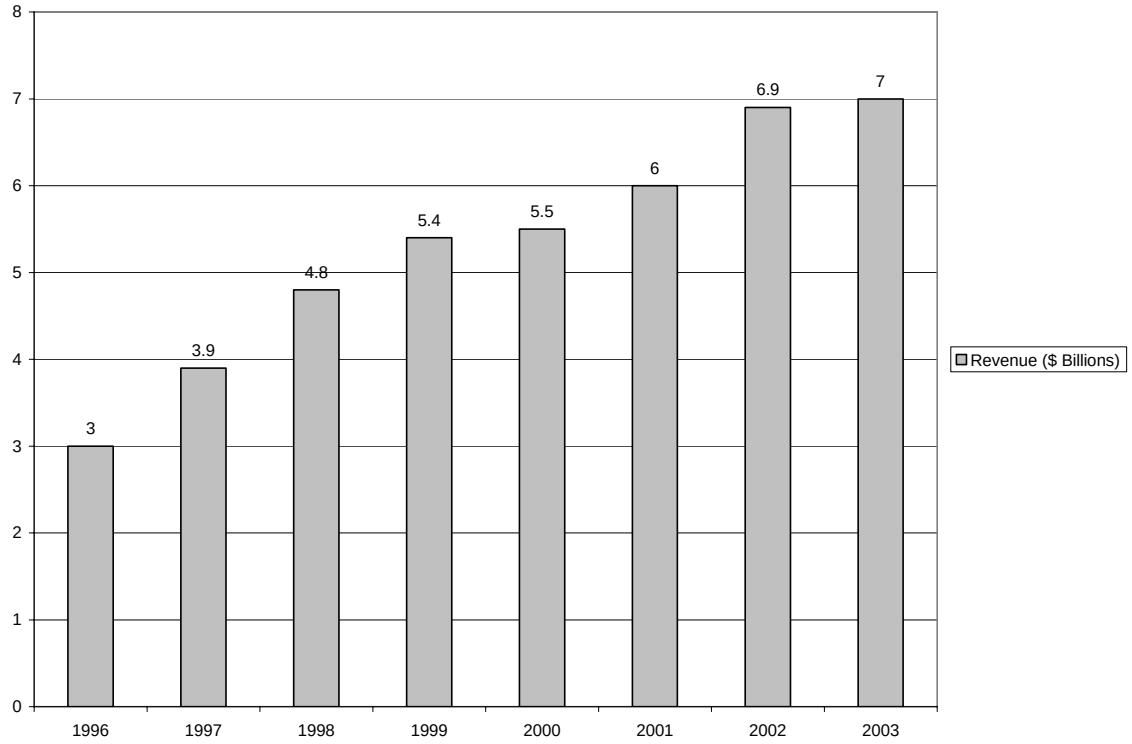

Figure 1. Videogame industry sales growth, 1996-2003

Recent Legal and Social Developments

The immediacy of the need for sound research on possible effects from violent video games largely stems from the abundance of recent bill proposals, court rulings, and

lawsuits. A number of government entities have proposed bills that would fine retailers who sell M rated games to minors, or force them to stock violent games behind the register, in a separate area from the other games. Some of these bills are under discussion in various committees, others have been struck down as unconstitutional, and others are the subject of legal action from the video gaming industry (e.g., Varanini, 2003: Gamespot, 2005; Associated Press, 2005). An Illinois bill proposed the development of a state-sponsored ratings system for video games, an alternative to the ESRB ratings (Gamespot, 2005).

Many of these legal actions were motivated in part by the assumption that playing violent video games had a deleterious short or long term effect on those playing the games, especially vulnerable populations such as children and adolescents. Unfortunately, there is relatively little research on the behavioral and psychological impact of playing video games. As previously discussed, extrapolations from the extensive research on television to video games are of questionable validity. Therefore, in the interest of promoting scientifically sound public policy, research needs to be conducted to identify any undesirable short or long term effects that might occur after playing violent videogames.

Foundational Research

Prior to the mid 1990s, research on potential effects of violent videogames was flawed due to the relatively primitive nature of the games, though obviously this was a problem inherent to the technology of the time, not the researchers or their experimental designs. Games of this era were largely symbolic in their aggression, such as “Pac-Man”

eating pellets and ghosts in a maze. As games became more advanced through the late 1990s and into the next millennium, the most consistent change in terms of game content was not in mature/violent themes, but rather in the level of realism in these violent depictions, as a function of advancing technology.

Recent Research

The majority of research investigating the effects of violent videogames on behavior can generally be placed into two main categories, correlational and cognitive-experimental. That is, modern research either examined correlates of aggressive game play, or interpreted experimental results using generally cognitive constructs. In the former category, research has found correlational relationships, some weak and some fairly compelling, between extended videogame play and a variety of variables. Some of these correlations are fairly predictable, such as a negative correlation between time spent playing games and grade point average (Gentile, Lynch, Linder, & Walsh, 2004). This is not too surprising, given the fact that gaming time would likely cut into study time, as would any recreational activity that engaged students for protracted periods of time. Other correlations are less predictable and possibly more troubling from a clinical or societal perspective. For example, playing violent video games has been positively correlated with a history of 'delinquent behavior' (Anderson & Dill, 2000), and arguments with teachers and trait hostility (Gentile et al., 2004). Videogame playing has also been negatively correlated with empathy (Funk et al., 2003). Unfortunately, this body of descriptive research suffers from limitations that pertain to all correlational research—one cannot conclude a causal role for videogame play from correlational

research alone because of the possibility of an unidentified third variable causing both of the correlated variables, and because of difficulties in determining the direction of causality between correlated variables.

A number of researchers have attempted to go beyond correlational research on violent video games by conducting studies that involved experimental designs and the manipulation of independent variables. Anderson and Dill (2000), in what remains the most comprehensive study on this topic, concluded that participants who were randomly assigned to a group that played violent video games scored significantly higher than participants who played nonviolent games on measures of aggressive affect, aggressive thoughts, and aggressive behavior. Other than some more straightforward factual errors, (their violent game, "Wolfenstein 3D," does not have a flame thrower as a possible weapon, as listed in their description, and there is no record indicating the United States military used the game "Doom" to train soldiers in how to kill), the study did in fact find that participants who played the violent game had more easily accessible hostile thoughts, and chose to deliver more punitive blasts of noise to confederates than those who played a nonviolent game.

However, as is common with new lines of research, the results of this study must be interpreted cautiously in light of limitations on the dependent variables measured in this study (Anderson & Dill, 2000). Because of ethical considerations, most experimental research on aggression relies on analog measures of aggression rather than measures of naturally occurring aggression. While analog measures are convenient and often more ethical measures of aggression, they present a number of interpretation

challenges. For example, some analog measures sample behavioral or cognitive effects (e.g. self reports of attitudes. intentions, and interpretations) that may not be correlated with aggressive actions thus raising concerns about the validity of these analog measures. In other instances, analog measures often include an operation designed to provoke aggressive behavior (e.g., exposure to annoying or aversive stimuli). In such cases it may be difficult to determine if the more distal independent variable of interest (e.g., prior exposure to violent video games) or the more proximal provoking conditions were the cause of any increment in measures of aggression. This, however, is a problem in measuring aggression that is not unique to this literature, and is partially controlled by manipulating trial success and failures, ensuring each participant encounters the same simulation experience.

For example, Anderson and Dill (2000) had participants play either a nonviolent or violent video game prior to participating in an analog measure of aggression in which aggression was measured via the intensity and duration of noise blasts delivered to an opponent in a pseudo-competitive simulation. In this simulation, the blast of noise could be avoided by pressing a button quickly enough. Because the participants were also exposed to high decibel noise blasts supposedly emanating from their simulated opponent, it is possible that “aggressive” responses in the analog measure was more heavily influenced by exposure to aversive noise than by a more distal exposure to a video game.

Admittedly, Anderson and Dill (2000) did an excellent job at partially controlling for potential confounds, by having each participant win 13 and lose 12 trials, along with a

set number of intensity levels and noise blast durations across the entire experiment, thereby presumably ensuring any difference between the two groups would be from the playing the videogame itself, not from the characteristics of the simulation. However, random assigning of the noise patterns for each participant, while presumably adding to the believability of the study, makes the experiment much different for each participant. For example, participants who received high intensity noise blasts early in the sequence may have responded more aggressively throughout the ensuing trials than those subjects who did not receive high intensity noise blasts until later in the 25 trial sequence.

Anderson and Dill (2000) also argue that violent game play makes violent thoughts more cognitively accessible, as evidenced by the use of a reading time reaction test. In this measure, words with different types of connotations (anxiety words, escape words, and control words) were flashed on a computer screen, and participants were asked to say individual words as quickly as possible. Despite finding statistically significant results between the two types of games, where those who played the violent game spoke the violent words more quickly than those who played the nonviolent game, tasks such as these are of questionable validity, as they can unintentionally measure reading speed and covert verbal processing rather than some tendency towards aggressive behavior. An alternative explanation may be that the difference in pace of the two games used in the study (their violent game requires a great deal of active participation, while the nonviolent game is a fairly passive “point and click” experience) might have been the primary variable ‘priming’ aggressive thoughts, simply by forcing the player of the violent game to be more physiologically aroused as a result of playing.

Other experimental research has demonstrated fairly consistent results indicating a possible connection between violent videogame play and a variety of analog measures of aggression. For example, Sheese and Graziano (2005) measured aggression with the "Prisoner's Dilemma," a classic decision matrix whereby the highest level of reward is gained by exploiting the opponent, causing them to lose points. Mutual cooperation ensures a slightly lower level of reward for both players, and mutual exploitation results in both players losing a significant amount of reward. The most interesting aspect of this study was how they used the same video game ("Doom") for both groups, but altered the amount of violent content. This eliminates potential confounds related to divergent game content, but it is very difficult to design such a study, as it generally requires programming skill to modify the game code to remove the violent content. The results of the study showed that those who played the violent version of "Doom" exhibited more exploitative behavior in the Prisoner's Dilemma simulation than did those who played the nonviolent version of the game, although there was no effect on what they thought their partner would do to them, In other words, participants who played the violent version of "Doom" did in fact respond in a more exploitative fashion than those who played the nonviolent version, but there was no systematic difference in what they thought their 'opponent' would do to them. "This pattern of results suggests that playing a violent video game may have an effect on cooperative behavior independent of alterations in the perceptions of other people's motives" (Sheese & Graziano, 2005).

Deselms and Altman (2004) used a different analog measure of aggression: the length of prison sentences given to criminals in fictitious vignettes. Vignettes were read

immediately after playing a violent or nonviolent game, or (in a second experiment) one hour later. This kind of dependant variable, an indirect/attitudinal one due to it presumably altering attitudes and worldviews rather than immediate behavior, has not received enough attention in the experimental literature; it could be that violent video game play does not have immediately obvious short term effects, but rather subtle changes on the player's worldview, (i.e. the ease with which they would sanction violence or punishment as a solution to problems, etc.). Despite finding a statistically significant difference in the length of prison sentences given by the two groups, the study had a serious confound in that the games were from very different genres, one being a fighting game (Mortal Kombat) and the other a basketball game (NBA Jam). Thus the games differed on many dimensions above and beyond violent content. Furthermore, the games were quite outdated at the time of publication and do not reflect the evolution of graphic game content over recent years, with both games being released in the early 1990s.

Potential confounds associated with highly divergent game content are common to research on video game violence. For example, studies have used pairs of games that bear little resemblance to each other in terms of pace (Uhlman & Swanson, 2004), difficulty, or genre of game (Deselms & Altman, 2004). Even Anderson and Dill (2000) admitted this confound in 2000, before the majority of the experimental research was conducted, noting "However, none of these studies can rule out the possibility that key variables such as excitement, difficulty, or the enjoyment created the observed increase in aggression". Because of this consistent oversight in the experimental literature,

considerable caution must be used when examining initially compelling meta-analytic reviews of the effects violent videogames have on aggressive behavior, aggressive cognition, aggressive affect, helping behavior, and physiological arousal (Anderson, 2004).

It is not difficult to select a violent game and a nonviolent game to compare, but these games may differ in many ways besides violent content, thus creating the potential for serious confounds. For instance, choosing a highly demanding, fast paced, difficult violent game and comparing it to a passive, slow paced, easy nonviolent game may produce differences in subsequent measures of aggression because of many variables that are unrelated to violent content (e.g., frustration or annoyance with the difficult game, elevated physiological arousal from the fast paced game, boredom and inattention associated with the slow paced game). As an example of this type of confound, a recent study compared Doom, a fast paced shooting game, and Mahjongg, a deliberately paced puzzle game, and argued that participants who had played Doom associated themselves more with aggressive traits and actions than those who played Mahjongg (Uhlmann & Swanson, 2004). This difference could easily be more a function of a variety of qualitative differences between the two games beyond violent content.

Additionally, one could also select similarly paced and difficult games, but ones that require much different response repertoires for success; for example, a driving game and an action game require much different responses for success, with one making the player engage in very realistic violent acts, and the other merely having the player make quick decisions while driving a car. Even if both games were violent, the type of

behaviors needed to progress in the game could be much different. Admittedly, it is not known how severe a confound different in-game response requirements may be, but controlling for this in advance is an extra precaution that can help ensure equivalence on as many dimensions as possible. There is a need, then, for future studies to match the games being used on as many variables as possible other than the amount of violent content. Studies that fail to do this contain confounds that potentially preclude any significant conclusions from being made about the effects of violent video games on behavior and/or thoughts.

Summary

Based on the importance of the topic, the growth of the industry, the relative lack of methodologically controlled research, and the flurry of law proposals, the purpose of this research project was to determine what short term effects, if any, result from people playing video games with violent/aggressive content. An additional aim was to interpret the results in a behavioral fashion, without using more abstract conceptual constructs, such as the General Affective Aggression Model (GAAM) originally proposed by Anderson & Dill (2000). This model proposes that personological and situational variables combine in certain people to produce violent behavior by influencing various internal states. Numerous studies interpret their results using this construct (Gentile et al., 2004), but this was not done in this study, for reasons which will be explained in the discussion section.

Participants played one of two games that were matched on as many dimensions as possible (other than the amount of aggressive content). Physiological, behavioral, and self-report measures were examined. The participants were all men aged 18-21 years.

Methods

Overview

The experiment reported herein was designed to determine what effect playing violent video games has on subsequent behavior, physiology, and attitudes. The independent variable was exposure to one of two video games with very different amounts and magnitude of aggressive content but otherwise similar play characteristics. The dependent variables were physiological, questionnaire, and behavioral measures, explained below.

Demographic

First, in an effort to explain why 18-21 year olds participated in this study, it is important to briefly point out that people who play videogames as young men typically do so starting during early adolescence, presumably continuing into young adulthood (Walsh, Gentile, VanOverbeke, & Chasco, 2002), the age range used in the study. Second, since the most recent industry survey found that the average age of a game player was 29 years old (Entertainment Software Association, 2004), a somewhat younger participant pool was studied because previous research has established that there exists an inverse correlation between age and the potential imitative effects of media portrayals (Hogben, 1998). In addition to this, research has demonstrated the existence of an inverse relationship between age and effect size of watching television (Paik &

Comstock, 1994). Finally, studying this group also allows the use in the study of games with a more mature content more suitable to a young adult developmental level, without the ethical risks or practical assent/consent difficulties of having adolescents or children play such a game.

Pre-experimental Game Selection

Prior to running participants, a wide cross-section of today's popular games was played by the experimenter in an attempt to isolate the two that were used in the study. The two games used in the study were matched on as many game play and graphical variables as possible, except for the amount of aggressive content, thereby isolating aggressive content as the key difference between them. Game matching was accomplished by utilizing the Game Matching Tool, (see Appendix A), which was created for this study.

The two games that were selected were "Need for Speed: Hot Pursuit 2," (henceforth referred to as the "NFS") and "Grand Theft Auto 3" (henceforth referred to as the "GTA"). NFS is rated "E" by the Electronic Software Ratings Board (ESRB), indicating the game is suitable for everyone, while GTA is rated "M", indicating that it is intended for players ages 17 and up. The content descriptors, also invented by the ESRB, are described in Table 1.

Game	Content Descriptors
Need for Speed: Hot Pursuit 2	None
Grand Theft Auto 3	Blood, strong language, violence

Table 1. Content of the games used in the study

The games are similar in that much of the response topography needed to perform well on them is the same. GTA and NFS are similar in that both games involve operating vehicles of various kinds. Driving vehicles quickly towards an objective while avoiding various obstacles is a game behavior that requires fairly homogenous responses (i.e. a button to accelerate, the directional pad to steer, etc).

In terms of game content, the two games are very different. In NFS the goal is to race with exotic sports cars against other cars to the finish line in order to win awards and championships in a wide array of fictional tracks across the world. The goal in GTA is to work your way up the crime underworld of a large fictional city. In doing so, the player accomplishes tasks such as carjacking, drug running, and drive by shootings, all in a three dimensional, non-linear game world. This game contains considerable graphic violence, and mild sexual innuendo.

Matching the games was conducted by videotaping the author playing each of the two games for approximately 30 min, and then counting each aggressive act during the course of normal game play, both realistic and unrealistic. It was not difficult to determine what qualified as an aggressive act in either game. The operational definition was “any action, intentional or not, that causes any kind of damage or collision with

another object in the game." This yielded an average amount of violent content per minute. To determine the level of arousal needed to play the game, the number of instructional inputs on the controller was counted, with each button push, joystick movement, and time spent holding down a button counted as an input. Each second the button was held down (to accelerate, for instance) counted as two inputs. Although somewhat arbitrary, it would have considerably skewed the results not to count holding a button down as multiple inputs, since doing so is a constant evaluative process that is probably just as arousing as repeatedly tapping buttons for short periods of time. The results of this analysis (see Appendix A-1/A-2), confirm the similarity of the two pairs of games in many dimensions except for the amount of aggressive content. The two games are reasonably close in instructional inputs needed per minute, with the key difference being the amount of aggressive content. NFS averaged 1.16 "cartoon" acts/minute, qualified this way due to a lack of negative consequences or visible damage stemming from them (street signs harmlessly floating away when struck). GTA averaged 5.34 realistic acts per minute, all realistic in their graphic depiction of blood, deaths, and other aversive consequences.

Interobserver agreement was collected on both pairs of games, by having another researcher watch the same tape of the author's hands and television screen separately, and counting the inputs and aggressive acts. The results of this are seen below (see Table 2):

Game	Inputs/min: Player A	Inputs/min: Player B	IOA%	Aggressive acts/min: Player A	Aggressive acts/min: Player B	IOA%
NFS	153	153	99.7	1.16	1.23	94.3
GTA	161	130	81.2	5.34	5.06	94.7

Table 2. Input variables and interobserver agreement on the games in the study

While the inter observer agreement of GTA seems low, it is important to keep in mind that several thousand button presses, along with many interspersed seconds of buttons being held down, occurred during each interval of time. Therefore, a large degree of human error is inevitable, but an IOA of greater than 80% was still achieved.

Setting

Experiments took place in the Behavioral Medicine Lab at Western Michigan University, 2704 Wood Hall. In the room was a rectangular table and chairs, a dry erase board, a computer, and several bookshelves. Only one participant participated at a time in this room, thereby ensuring privacy during the experiment.

Equipment

The equipment in the room relevant to the study was a laptop computer used for the simulation (explained in detail below), and for videogame play, a heart rate monitor attached to the participant's chest that transmitted to a wrist unit, and a portable blood pressure cuff.

Participant Selection and Informed Consent

Participants were recruited from a variety of undergraduate psychology courses (Introductory Psychology, Child Psychology, Abnormal Psychology, and Health Psychology). The experimenter read aloud a brief synopsis of the study and its requirements. Packets were then passed out to males in the class, as the experimenter read an approved script that provided more details about the study. The packet contained a consent form to complete the questionnaire, and the Game Play Habits Questionnaire, (see Appendix B). The script was as follows:

"Researchers from the psychology department of Western Michigan University are conducting a study assessing the potential physiological effects of video games.

We are soliciting participants who are males between the ages of 18 and 21. In order for you to participate in this research study, it is necessary to sign and return the consent form, copies of which are being passed around. If you are not interested in participating, still take a form, but simply leave it blank. This consent form is simply to participate in the first portion of the study, which is completing a questionnaire. If, based on your answers, you are eligible, and interested in completing the remaining portion, indicate so on the form, and a researcher will contact you to schedule a time at a later date.

If you have any questions, feel free to contact the faculty supervisor and principal investigator of this study, Dr. R. Wayne Fuqua, at 387-4474. You may also contact the Chair of the Human Subjects Institutional Review Board (387-8293) or the Vice

President for Research (387-8298) if questions or problems arise during the course of the study.

If you are interested in participating in this research project, please ***carefully read*** the enclosed consent form, complete the attached questionnaire, and wait for instructions on how to pass them to the front of the room."

The experimenter collected questionnaires and consent forms before leaving the class, and then contacted potential participants who, based on their questionnaire answers, were eligible for the remainder of the study via phone or email, whichever they indicated as preferred on the front of the packet. Eligibility for the main portion of the study was determined by the following criteria, all of which were included either in the consent form, or the questionnaire information:

- The participant must play videogames an average of 1 to 10 hours a week
- The participant must have NOT played either of the two games being used in the study
- The participant must have played an "M" (mature) rated game before
- The participant or family members must NOT have a history of seizure disorders
- The participant must NOT have a history of repetitive motion stress injuries

It was important to place tight thresholds for inclusion on both the upper and lower range of time spent playing games in the past week due to the fact that prior research has shown a ceiling effect for imitative violence (Hogben, 1998). On the other hand, too little prior exposure might cause the participants to emit novelty responses, as the player struggles to acclimate to the responses needed in the specific game, or games

in general. This could considerably complicate interpretation of the results. This range of average playing time was also used because industry statistics indicate that the average game player spends 7.4 hours per week playing video games (Entertainment Software Association, 2005). Only males (N=27, 12 in control, 15 in experimental) were studied so as not to introduce an additional potential confound of gender differences.

Step by Step Session Protocol

Step one

Participants, who had already met the inclusionary criteria established in the Game Play Habits Questionnaire and signed the consent form, had baseline measures of their heart rate and blood pressure taken, once any questions they may have had were answered.

It first bears explaining why the physiological measures used in this study as dependent variables were chosen. First is ease of measurement. Heart rate, as previously described, only required that each participant wear a chest strap and wrist transmitter, and a portable blood pressure cuff. The second reason is that elevations in blood pressure and/or heart rate are indicators of adrenaline-triggered physiological and neural changes, many of which are associated and/or correlated with aggressive behavior (Mercola, 1999).

Step two

Then, participants were then asked to complete the "Aggression Questionnaire," (AQ) which is a full revision of the Buss-Durkee Hostility Inventory, "a long-time standard for assessing anger and aggression" (Western Psychological Services, 2004).

The AQ was administered in order to get a self-report, questionnaire-based measure of the participant's pre-existing hostility. The AQ yields a T score (anchored at 50 for each scale, and normed against 2,132 people ranging in age from 9-88), along with scores on five subscales, Physical Aggression (PHY), Verbal Aggression (VER), Anger (ANG), Hostility (HOS), and Indirect Aggression (IND). The AQ typically was completed by the participant in about 10 minutes.

As participants completed the questionnaire, the experimenter explained that he would be going upstairs for a few minutes to check on the status of the other part of the experiment being conducted upstairs at the same time. This was done to enhance the believability of the computer simulation, described in Step four. Upon returning, the experimenter explained the status of the upstairs session, usually by saying that they would be ready in a few minutes, and waited to proceed until the participant completed the questionnaire.

Step three

Following this, participants were told they were going to engage in a brief computer simulation in which they could earn points toward a gift certificate prize drawing to be conducted after the experiment. It was imperative that the points be potentially exchangeable for reinforcing outcomes to the participant, to provide some motivation for competitive and cooperative responding when such response options are available. If the participant did not value simulation points, then responding would have likely been random and thus meaningless.

In this simulation, participants were told that they were playing against another student also participating in the study at the same time; this "opponent" was actually a pre-programmed computer-generated opponent. This deception, in addition to being fairly benign, was necessary to convince the participant that his performance during the simulation was significant and provided some opportunity for cooperation or aggression with respect to the "opponent." The three choices they could select from for each trial were also explained to them at this time, using the chart below as a reference. Questions were answered about the simulation prior to beginning, so that the participants did not have to spend several trials determining what choices were available to them, and the consequences for each choice.

Typical questions that participants asked before the simulation began dealt with seeking clarification on the significance of the points, if the "opponent" was in the participant's psychology class, (the experimenter replied he didn't know for sure) and if the "opponent" could see the participant (it was explained that the fact the participant could see the "opponent," but not vice versa, was one of the variables being looked at. This is explained in more detail below).

Typical questions asked during the simulation were concerned with whether pressing the fire button more quickly could improve performance, and how the participant could do better (it was explained that the simulation was simply the graphical representation of the chart in front of them, see below).

Simulation characteristics. The simulation consisted of fifteen independent trials. In each trial, 10 points were at stake, and were divided between the participant and the

confederate based on the decision the participant made for each trial. Participants earned one entry in a raffle for each point earned in the computer simulation. Two $50 gift certificates to Target were given away in a random drawing after the study was concluded. It was important to have benefits in addition to playing the game, since the inclusionary criteria ensured that recruited participants already spent regular amounts of time already playing videogames. Thus, without additional compensation, no unique incentive existed for them to play games in this study as opposed to on their own time. Finally, as discussed above, the raffle prizes were essential to maintain the value of points, or else participants would not respond in the simulation as they normally would if they valued the points.

The basic setup for each trial choice was explained prior to beginning the simulation. Participants had one of three choices in each trial:

1) They could choose to **compete** for the ten points, in which case they engaged in a brief competitive game. In this game, the participant is told he is competing against the "opponent" to hit the common enemy at the top of the screen more times than the "opponent". The participant pressed the mouse to fire intercepting 'missiles' from their turret on the bottom. The person who hit the common enemy more times won the trial and earn all ten points. Visually, the simulation consisted of simple graphics consisting of a background graphic, two missile stations (one for each player) and a common "enemy" at the top of the screen. The performance of the "opponent" (really the computer) was adjusted so that the participant won the game on 50% of the game play opportunities. Therefore, on average, choosing to compete, and earn either ten or zero

points, was equivalent to cooperating, for which the player earned a guaranteed five points each time.

2) They could choose to **cooperate**, in which case a cooperation-based game was played. This game is identical to the competitive one, except that the participant and computer were on the same team, with the goal to hit the common enemy multiple times by working together. To add to the believability of this game, the computer randomly assisted in destroying 25%-75% of the missiles on each trial when this sub-simulation was chosen, so as not to make each cooperative trial look the same. Regardless of the percentage of missiles destroyed by the computer on any given trial, the points were evenly split between the participant and the "opponent".

3) They could choose to **aggress**, in which case a game was played that was similar to the competitive and cooperative ones, with the difference being that the participant was placed in an aggressive role in which he fired missiles at the "opponent" who was placed in a defensive role. The participant was allowed to win this competition every time it was played, and in so doing earn no points, while the loser (the "opponent") lost five points. It was important for the aggressor to earn no points when this decision was made so that the end result, a point loss for the opponent, was unique and both qualitative and quantitatively different from the other two choices, since this is the response most similar to actual aggression, which usually is directed towards harming another rather than gaining something by the aggressor.

For the first three trials, the computerized confederate behaved in a scripted order of responses as follows. 1)Cooperate 2)Aggress 3)Compete. This order attempted to

prevent a sequence effect from emerging that might make some participants think that the opponent was becoming progressively less “friendly” as the trials progressed, which could have influenced their subsequent responding. Instead, the confederate behaved ‘friendly,’ ‘aggressively,’ and ‘neutral,’ in that order. For the remaining twelve trials, it chose the same selection that the participant chose the trial before.

The following table illustrates the payoff that occurred depending on the decision of both the participant and the confederate. The participant received this table prior to engaging in the simulation, with the word “confederate” replaced with “opponent” (see Table 3).

Participant Decision		**Confederate Decision**	
	Cooperate	*Compete*	*Aggress*
Cooperate	Split ten points (5/5)	Compete for all ten points (10/0 or 0/10)	Player loses five points Confederate earns zero points (0/-5)
Compete	Compete for all ten points (10/0 or 0/10)	Compete for all ten points (10/0 or 0/10)	Compete for all ten points (10/0 or 0/10)
Aggress	Player earns zero points Confederate loses five points (0/-5)	Player earns zero points Confederate loses five points (0/-5)	Player earns zero points Confederate loses five points (0/-5)

Table 3. Simulation decision matrix

An interface on the bottom left portion of the screen allowed the participant to click on their choice for each trial, while the rest of the screen was divided as follows: The main game interface took up about 60% of the top and middle of the screen, with the background, missile stations, and enemy at the top. Below that was a summary of the previous trials, along with point breakdowns for each, while in the bottom right there was a picture of the imaginary confederate included to add believability. The picture used to represent the opponent was one of several randomly chosen by the program, and all looked like college-aged undergraduate males; the pictures came from public domain

sources online. If the participant inquired about the picture, it was explained that the "opponent" had a webcam on their computer that took a still picture of them, and that this was one of the variables the study looked at. Pictures were randomly rotated to prevent participants from seeing the same picture as one of their friends who may have also completed the study, and figuring it out. If this happened, presumably the participant(s) would tell their friends, making future participants from that class emit reactive effects to the simulation.

To add to the believability of the simulation, underneath the picture was one of three phrases, which corresponded to the computer's choice during each trial. The phrases were "I'll get you" shown during an aggressive trial, "Let's work together" shown after a cooperative trial, and "I'll get them all" shown on a competitive trial. These responses were fairly generic, so as not to become a more proximal source of aversive stimulation for the participant. They were solely included to add believability to the simulation; if the participant asked about the text, he was told that only the opponent could type responses to him and not vice versa, as that was another variable being examined.

Although this simulation was custom-made for this study, it has similarities with a reaction-time based simulation utilized by Anderson and Dill (2000). Both simulations are similar to the Taylor Competitive Reaction Time task, "which is a widely used and externally valid measure of aggressive behavior" (Anderson & Dill, 2000). The goal was to create a mildly engaging task to study aggressive decision making, without the simulation itself becoming the more proximal source of any aggressive behavior.

The points should not have interfered with the aggression measures because the participant would earn points during the simulation regardless of performance, but how many points the participant earned was entirely up to his own decision making. Even aggressive behavior is purposeful, as its primary purpose is to reduce the number of points the opponent earns, thereby reducing his total number of raffle entries, making the participant's chances in the raffle statistically better, albeit not by very much at a time.

Step four

Once the pretest portion of the simulation was complete, participants were assigned to play the games in a quasi-random manner. This was accomplished by the experimenter randomly selecting one of the two games by flipping a coin. If the number of previous participants who played one game had a greater than two participant differential, the next participant was be assigned to play the other game, until the number of participants who have played each game was even. If the participant played NFS (regardless of whether or not they had played it before, since this was not a variable of interest or concern), their data would be collected with Group 1. If the participant played GTA, and had ever played it before, they were placed in Group 2. If the participant played GTA and had never played it before, they were placed into Group 3.

Prior to beginning timed game play, participants were given a diagram of the controller with the function of each button labeled for their reference, along with a list of 'cheat codes' to ensure that the participants would have the freedom to play the game as they wished. Questions about the controls and codes were answered at this time. It was decided that the experimenter would not play the game in front of participants as a

tutorial because it was feared the choices the experimenter made during game play would influence subsequent participant game play decisions. Because all participants played video games on a regular basis, it was also assumed that they would be familiar with how to play them. No participants reported any particular difficulty in understanding how to play the game.

Besides choice, another dependent measure during game play was heart rate, measured using a momentary time sampling procedure. Participants wore a small chest attachment that transmitted to a monitoring unit observed by the experimenter. The other physiological measure that was recorded at, blood pressure, was measured at baseline levels at the start of the experiment, and then immediately after game play concluded.

Step five

Participants again completed the Aggression Questionnaire, to determine what effects the game play time had on their responses on this assessment tool. As before, the experimenter excused himself briefly during this time to check on the other part of the session, again in order to make the subsequent simulation more believable.

Step six

Additional dependent measures were taken at this point to assess the impact on aggressive behavior and its counterpart, cooperative behavior. These measures were collected using the same simulation taken before game play began, for fifteen additional trials.

Earned points could be redeemed for entries in the raffle for the two $50 gift certificates to be held at the conclusion of the study at the rate of one entry for every point earned in the simulation.

Step seven

Participants were then asked to complete the Videogame Evaluation Questionnaire, (see Appendix C). This form, an unpublished questionnaire, was created by Gentile at the National Institute on Media and the Family, as a questionnaire-based measure to assess important subjective characteristics of videogames. This brief questionnaire accomplished two main tasks. First, it provided a self report measure of how the participant thought the game may have affected them, and second, it provided a self report measure on a variety of other game play facets (e.g., difficulty, character identification) that could be used to determine how well matched the selected games were on major game play criteria, other than level of violence. This acted as a second measure to assess how well the games were matched beyond the pretest matching.

Step eight

Finally, a thorough debriefing took place after experimentation, during which the following topics were covered, and any questions were answered:

1) The complete purpose of the study was described, including discussing that behavioral variables were examined, along with physiological and attitudinal variables.
2) An explanation that another person was not involved in the simulation was not given. This is because there was no harm in having participants believe they

were playing against another student upstairs, and was a crucial variable for maintaining the integrity of the study.

3) Regardless of which game was played, the experimenter thoroughly explained to the participant that the content of the game was fantasy violence, and not to attempt any of it in real life. In the event that the participant played the nonviolent game, the same things were discussed as above.

Confidentiality of Data

All information collected from participants was kept confidential and their names did not appear anywhere on the questionnaires. The questionnaires and data summaries, including those that did not meet inclusionary criteria but were used for descriptive/ demographic purposes, will be retained for at least three years in a locked file in a research laboratory in the Behavior Modification Laboratory in 2704 Wood Hall at Western Michigan University.

Results

Eligible and Ineligible Participants Demographic Characteristics

Of the 225 people who completed a screening questionnaire, 49 met the requirements for inclusion in the study. Of the 49 number that were invited to participate, 27 completed the study. The age range of the two groups (all the individuals who completed questionnaires, versus just those who participated) was similar, (M=18.94, SD=0.17 yr for both eligible and ineligible participants, M=18.96, SD=0.20 yr for participants) ruling out any potential confound related to the age of participants between those who participated and those who were ineligible. Conversely, the two

groups were very different in terms of hours per week spent playing videogames (M= 10.63, SD=0.64 hours per week for non-participants, M=4.40, SD=0.68 hours per week for participants). This is not surprising, since many of the non-participants were deemed ineligible for the study because they exceeded the 10 hours per week maximum for amount of time spent playing. The variable of interest here for the actual experiment is the standard deviation of participants, showing that it was a fairly homogenous group with regards to typical playing time per week, minimizing the potential confounding effect that this variable might have had on the experiment.

Several other characteristics of the entire sample (N=225) bear mentioning, mainly because information of this nature has not previously been collected and published. It should be noted, however, that this was a small sample of the overall game playing population, and a homogenous one with regards to age, education level, rough income, etc., due to the fact that all respondents were recruited from college classes. Despite the fact the entire sample was in college at the time, 56 (25%) had been asked to provide identification in order to buy an "M" rated game, demonstrating that retailers may be doing an acceptable job at checking identification to sell violent games; one could speculate that the percentage asked for identification would increase in a negative correlation with purchaser age.

Finally, a large amount of data regarding games played in the last week were collected. In total, questionnaire respondents listed 228 different game titles and 655 total games listed. The ESRB rating breakdown of these games is as follows (note that

some older games do no carry ratings, as they were released before the formation of the ESRB, so N=191):

"E"(Everyone)-71 (37%)

"T"(Teen)-70 (37%)

"M"(Mature)-50 (26%)

It is interesting how, despite the public concern over "M: rates games, that only 26% of the games listed were rated M. When weighted to include multiple instances of the same game (for example, counting a game multiple times when multiple people played it in the past week, which is a better indication of game preferences, since it reflects multiple people playing the same game), the breakdown is as follows (N=570):

"E" (Everyone)-228 (40%)

"T" (Teen)-125 (22%)

"M" (Mature)-217 (38%)

Here the selection of "M" rated games is noticeably higher, but only slightly more than one third. Again it is difficult to evaluate this information, because it exists in a vacuum given the lack of published data on this topic.

Eligible Participants

Initial group classification

The primary decision that needed to be made when interpreting the data was whether to classify Group 2, those who played GTA in the study and had played it before, and Group 3, those who played GTA in the study but had not played it before, as one larger group; Group 1, those that played NFS, did not need a potential sub-classification

to be made, since none of them had played that particular game before. If there was no compelling reason to treat groups 2 and 3 as separate, it would help to combine them as one larger group for statistical purposes, due to having a larger N. Conceptually this could be done because although the participants in group 3 had not played GTA, they had played other games rated "M" which would have a similar level of violent content. It was important not that they had played GTA per se', but rather that they had played a comparable game. Thus, any impact from playing a game with that type of content for the first time would have already occurred, meaning that groups 2 and 3 were in fact equivalent due to prior violent game play experience.

Physiological

To determine this, a visual inspection of the data was conducted in order to determine if these groups were in fact qualitatively different, the results of which indicated that the two groups could safely be combined with regards to data analysis. The results of the visual inspection (statistical analysis was not needed, due to how conclusive the visual inspection turned out to be) are as follows:

Group two's average heart rate began at 79 beats/minute, and ended at76 beats/minute, with an average of 74 beats/minute (See Figure 2). Group 3 began at 85 beats/minute, ended at 80 beats a minute, with an average of 80 beats/minute. Additionally, the two groups were closer together in beats/minute at the end of game play than they were at the beginning, and both exhibited a modest downward trend, suggesting similar physiological responding. Group two's average blood pressure changed from 131/74 to 121/72 immediately after game play. Group three's average changed from

125/70 to 124/69 immediately after game play (See Figure 3). Although the numbers are not identical, differences between the two groups were small, and both groups showed a modest downward trend in both measures while and after playing the game.

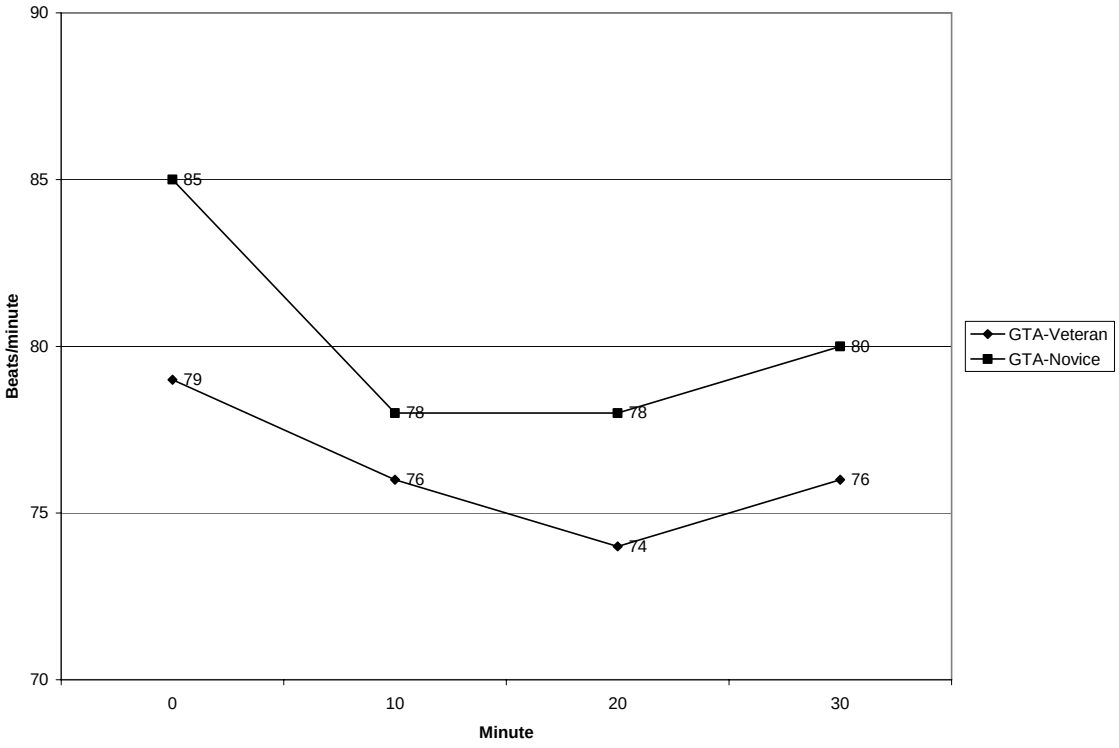

Figure 2. Physiological aggregate data-groups 2 and 3

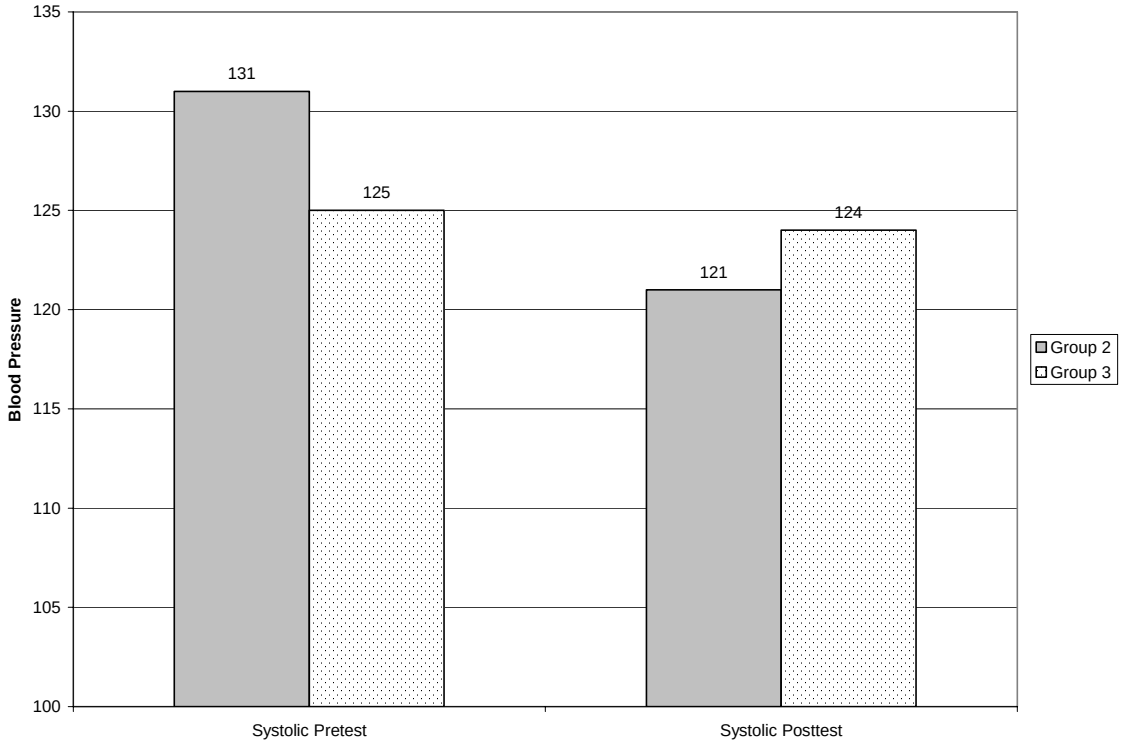

Figure 3. Blood pressure aggregate data-groups 2 and 3

Questionnaire

Group 2's overall average T score for the AQ was 50.65 on the pretest, and the posttest T score average was 49.62. Group 3's overall T score for the AQ was 47.43 on the pretest, and 48.13 on the posttest (see Figure 4). With the T scores anchored at 50 being 'normal,' and the fact that this is easily within one standard deviation of the overall T score (SD=5), the difference between the groups is not considered particularly significant. This is particularly true considering the groups became more similar in posttest, indicating that they felt more similar in their attitudes related to aggression after game play than before. With how similar the overall T scores were, no further analysis

was needed, other than pointing out the five subscales were similarly close in value between groups.

Behavioral

On the pretest simulation, Group 2 selected an average of 6.7 cooperative responses, 4.7 competitive responses, and 3.6 aggressive responses. At posttest, it was 4.7, 5.9, and 4.4. Group three's pretest data were 4.8 cooperative responses, 6.8 competitive, and 3.4 aggressive. The posttest choices for this group averaged to be 5.2 cooperative responses, 5.8 competitive, and 4.0 aggressive (see Figure 4). Again, all three values were closer to each other at the posttest, indicating that the two groups responded similarly to the game play; despite moderate differences at pretest, the fact they ended up more similar at posttest seems to indicate similar responding patterns from playing the violent game, thereby making it possible to combine them for a more robust statistical analysis.

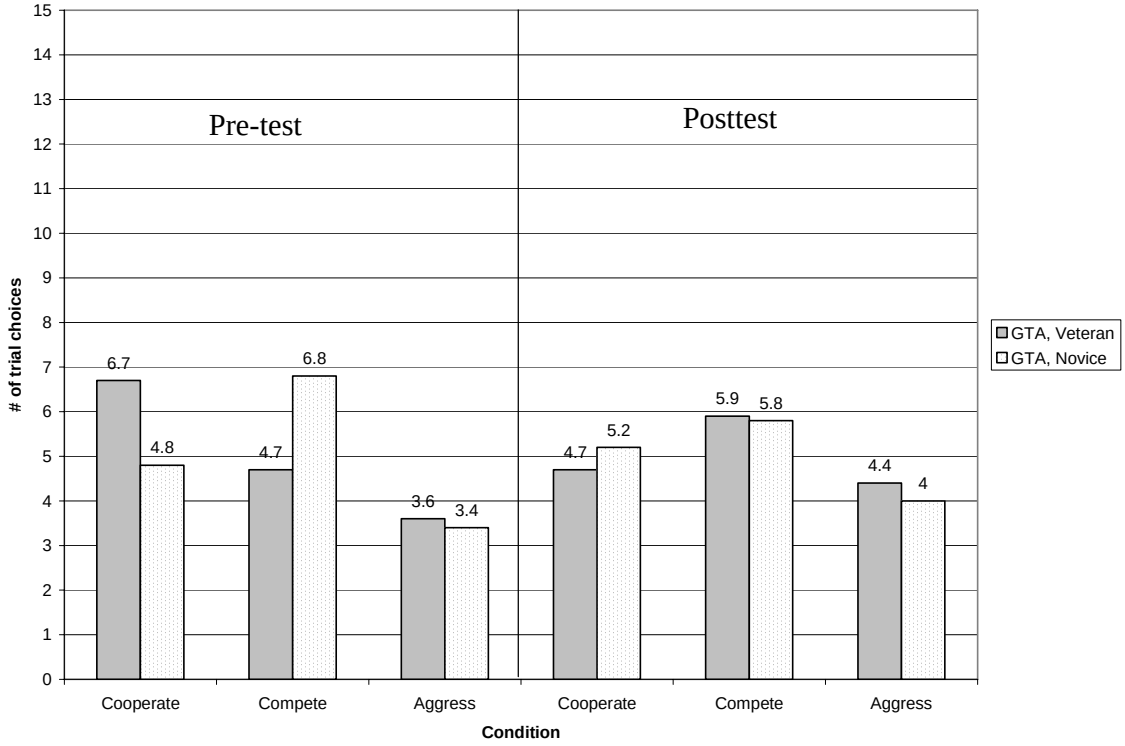

Figure 4. Simulation decisions of groups 2 and 3

Results, Groups 2 and 3 Combined Into Group 2

Overview

The descriptive portion of the data analysis was primarily concerned with visual inspection of the graphs for each dependent variable, to determine if there were differences between Group 1 (NFS) and Group 2 (combined GTA). Because of the lack of differences between the two groups in any of the dependent variables being examined, visual inspection ended up providing fairly compelling conclusions. For a more complete analysis of the data, the inferential portion of the statistical analysis for this study was concerned with 3 primary questions, each involving several dependent variables (behavioral, physiological (two types), and self-report (two types)):

1) Were there significant differences between the two groups at pretest?

2) Were there changes over time within each group?

3) Were there changes between groups upon posttest?

In other words, were the two groups suitably equivalent before game play started, did each condition within each group change as a result of game play, and did the two groups end up statistically different at posttest? ANOVAS (repeated measures with question # 2) with a correction for different sample sizes were run in each case to determine the answers to each of these questions.

Physiological

Descriptive

Very little physiological change occurred within either group, and also between groups. Group 1 fluctuated within a range of 3.33 beats/minute (76.09 to 79.42) during the 30 minutes spent in game play, while Group 2 fluctuated within a range of 5.37 beats/minute (75.50 to 80.87) during the 30 minutes spent in game play (see Figure 5).

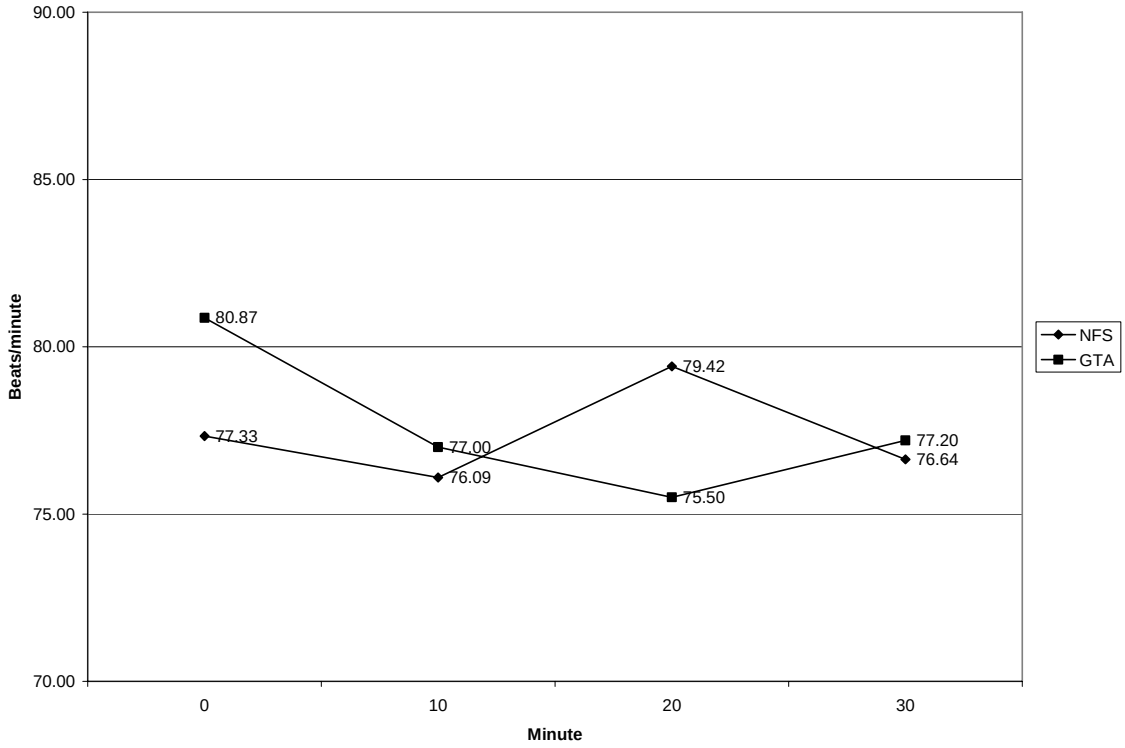

Figure 5. Physiological aggregate data-NFS and GTA

Although Group 2's upper and lower heartbeat range was larger and changed more from pretest to posttest, it actually decreased across time, with the highest level recorded before game play started. This implies less physiological arousal as a result of playing the violent game, although the decrease was modest. Additionally, the two groups ended up closer at posttest than they were at pretest.

Blood pressure showed similar stability within and between groups (see Figure 6).

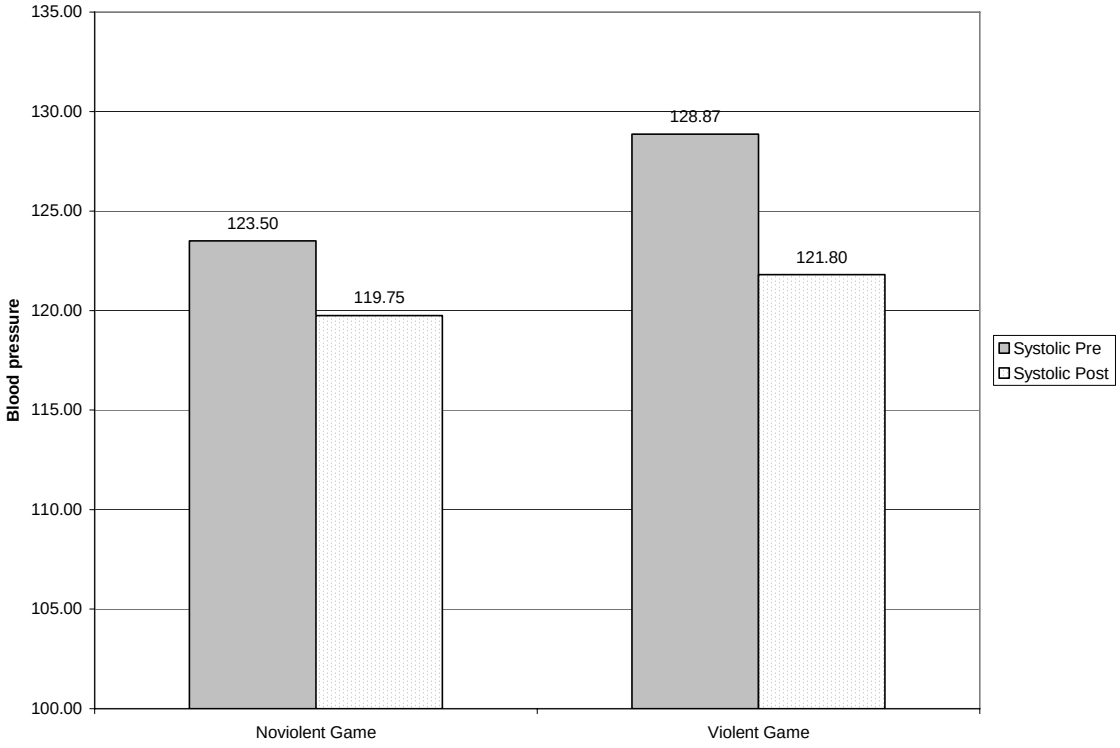

Figure 6. Blood pressure aggregate data-NFS and GTA

In this situation, it would be expected that only systolic blood pressure would show change to such an environmentally-based short term trigger, whereas diastolic blood pressure usually responds to more chronic conditions, such as clogging of arteries, etc. (GNC, 2005). The following table illustrates normal blood pressure ranges for healthy adults (Lifeclinic, 2005) (see Table 4).

Category	Systolic (Top number)	Diastolic (Bottom number)
Normal	Less than 120	Less than 80
Prehypertension	120-139	80-89
High Blood Pressure	Systolic	Diastolic
Stage 1	140-159	90-99
Stage 2	160 or higher	100 or higher

Table 4. Normal blood pressure ranges for adults

The only piece of information specifically of note from figure 6 is the fact that both groups decreased in blood pressure from before to after game play, albeit in very modest amounts. This again suggests a small decrease in physiological arousal from playing any type of game, regardless of content. The decrease was not large enough to suggest any cathartic effect from playing video games, because blood pressure shows a moderate degree of stability over time, given normal activities; the changes in figure 5 would likely fall within that normal range (Lifeclinic, 2005).

Inferential

A series of ANOVAS were conducted with both physiological measures, heart rate and blood pressure, as the dependent variable to answer the questions posed at the beginning of the results section, namely, if there were preexisting differences between groups, if each group changed as a result of game play, and if the two groups ended up significantly different at posttest.

Question #1 (Were there significant differences between the two groups at pretest?)-A one-way ANOVA was conducted comparing the pretest heart rates between the groups. There were no statistically significant differences between the two groups at

pretest (N=27, F=0.43, P=0.516). A one-way ANOVA was conducted comparing the pretest blood pressure between the groups. There were no statistically significant differences between the two groups at pretest (N=27, F=1.91, P=0.179).

Question #2 (Were there changes over time within each group?)-A 2 factor general linear model ANOVA (due to differences in group sizes) was conducted to compare pretest to posttest heart rate within each group. There were no statistically significant differences within each group from pretest to posttest from game type (F=0.32, P=0.577) time (F=0.36, P=0.552) or the interaction of the two (F=0.17, P=0.686). The same type of ANOVA was also conducted comparing blood pressure within each group. There were no statistically significant differences within each group from pretest to posttest from game type (F=1.41, P=0.241) time (F=2.99, P=0.090) or the interaction of the two (F=0.28, P=0.598).

Question #3 (Were there changes between groups upon posttest?)-A one-way ANOVA was conducted comparing the posttest heart rates between the groups. There were no statistically significant differences between the two groups at posttest (N=26, F=0.01, P=0.910). The same type of ANOVA was conducted comparing the posttest blood pressure between the groups. There were no statistically significant differences between the two groups at posttest (N=27, F=0.17, P=0.679).

In conclusion, it is important to note is the fact that other studies have reported mixed findings. While some did not find significant physiological changes (Anderson & Dill, 2000), other meta-analyses isolated specific studies that did, and found statistical significance on heart rate and blood pressure (Anderson & Bushman, 2001). This would

seem to firmly establish that if any effects do in fact exist, they are not consistently causing aggression or hostility by physiologically agitating the game player, at least not in ways that would alter blood pressure or heart rate.

Self-report

Aggression Questionnaire

An initial decision as to the classification of some of the participants needed to be conducted prior to data analysis. The AQ divides responders into three age demographics, each normed against a different sample. These categories are "Youth (9-18)", and "Adult-Young (19-39), Adult-Older (40+)" (Buss & Warren, 2000). Because this study recruited participants between the ages of 18-21, a determination needed to be made as to how to classify the 18 year old participants, (9 in all), in terms of their T-scores. Ultimately, these nine participants were counted with the Adult-Young group, mainly because of an assumed maturity level that comes with being relatively independent due to being in college. These 18 year olds likely have more in common with their 19 year old classmates than they would with 18 year olds still in high school. It should be pointed out that the T-score differences between the 18 year olds and the 19-21 year olds were not extreme, usually skewing 3-5 points lower on each scale for the Youth scoring scale, but a determination still needed to be made for the purposes of data summary and analysis. Visual analysis showed that counting the 18 year old participants as adults actually brought them closer in mean t scores to their 19-21 year old peers.

Descriptive. The results of the aggression questionnaire showed a consistent pattern of similar responding both before and after game play, in both groups. The

overall T score for the AQ in Group 1 decreased from 48.67 to 48.42, with the mean of the test with regards to a 'normal' level of aggression being 50.00. In group 2, it decreased from 48.53 to 48.40. (see Figure 7).

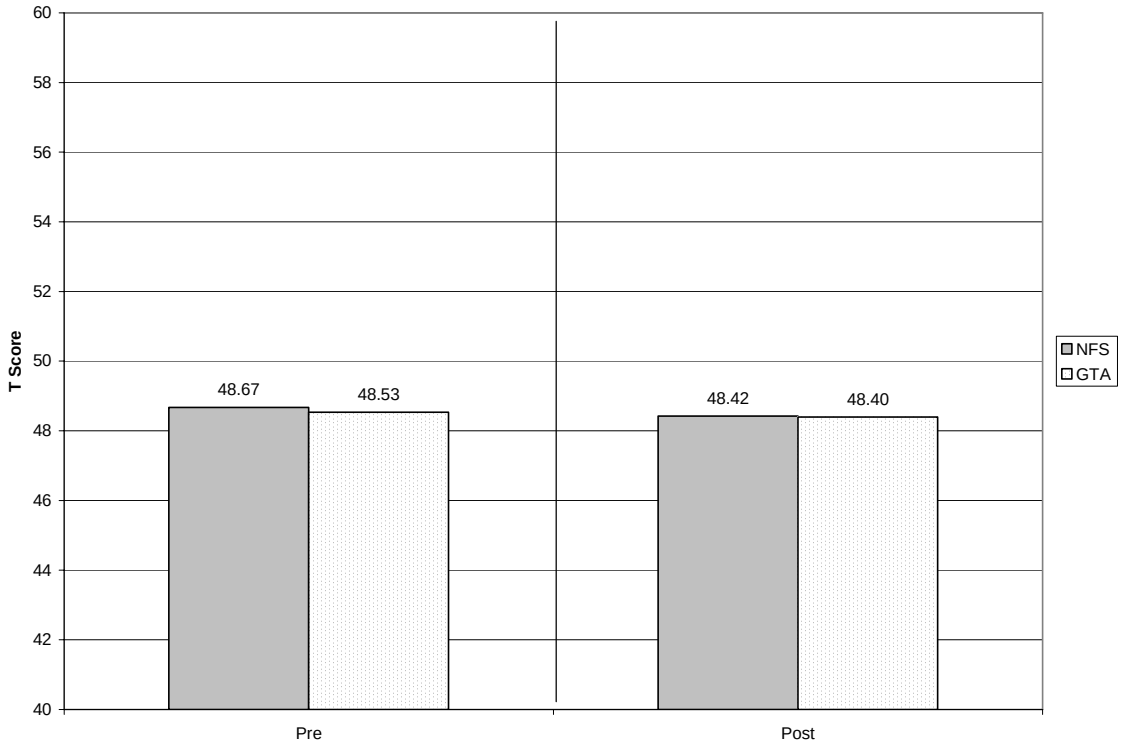

Figure 7. Overall AQ T-scores

Not only is this difference trivial, but interestingly, both groups decreased by an almost identical amount. If game play had any effect, it is certainly not being measured by the Aggression Questionnaire. With group 1, on the five subscales, two of them increased in statistically insignificant amounts, (Physical Aggression, T=48.17 to 48.67, and Verbal Aggression, T=52.08 to 52.17) while three of them decreased in similarly insignificant amounts (Anger, T=49.00 to 47.67, Hostility, T=50.00 to 49.00, and Indirect Anger, T=51.58 to 50.67) (see figure 8).

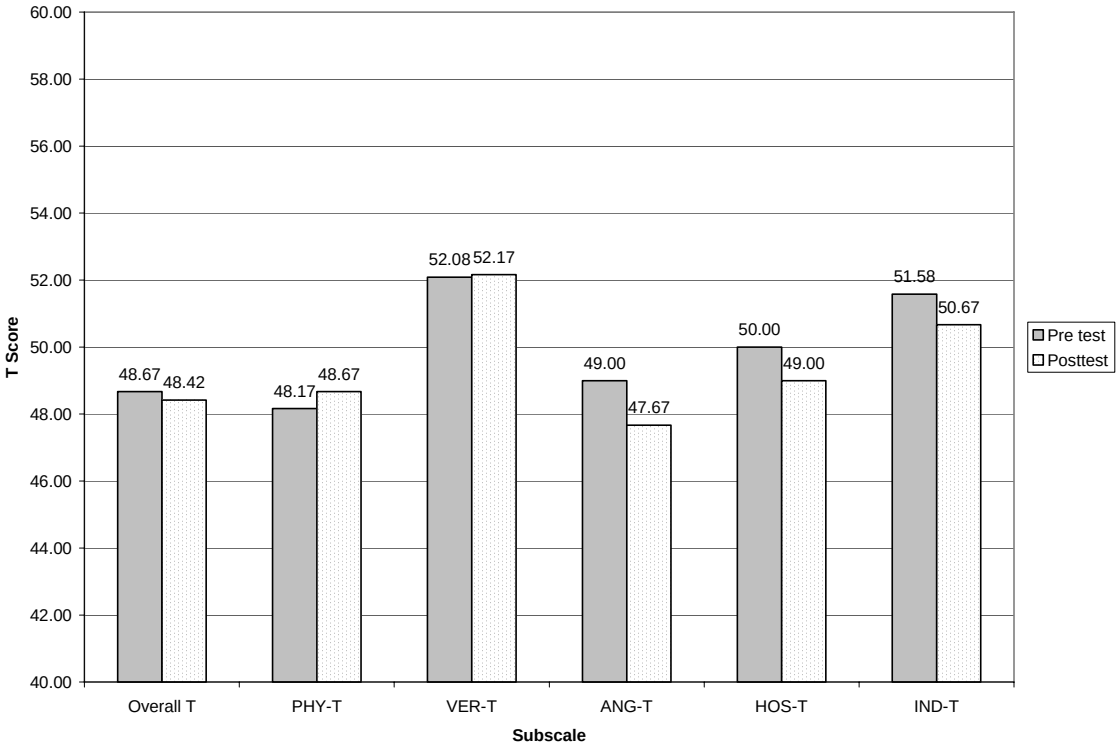

Figure 8. AQ T-scores, NFS

With group 2, four of the subscales decreased in statistically nonsignificant amounts, (Verbal Aggression, T=52.2 to 51.00, Anger, T=46.2 to 44.8, Hostility, T=51.4 to 50.87, and Indirect Anger, T=50.87 to 50.27) and one increased in the same fashion (Physical Aggression, T=48.27 to 49.40) (see figure 9).

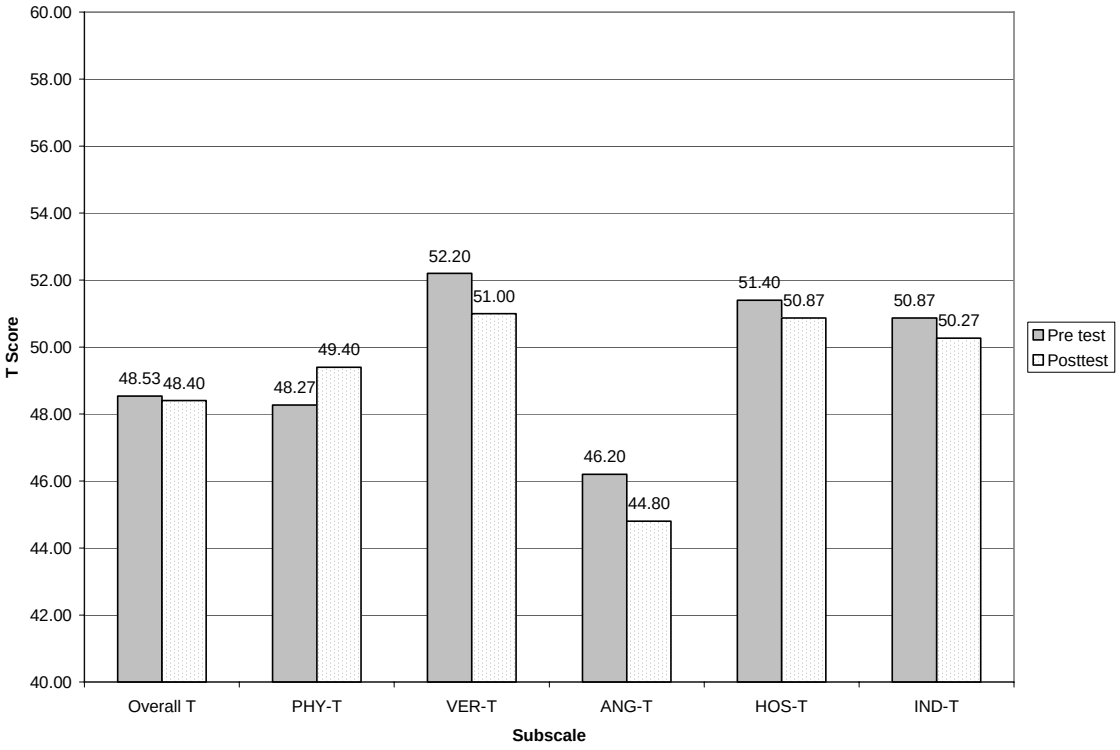

Figure 9. AQ scores, GTA

It was expected that the T scores for Group 1 would not change due to the benign nature of the game, but the lack of change in Group 2 seemed to suggest that violent games do not produce short term attitudinal changes, at least in this age range. Given the fact that the test-retest reliability of the AQ is .8 (Buss & Warren, 2000), the data from the overall T scores, as well as the subscales from each group all fell well within expected statistical variation.

Inferential. A series of ANOVAS were carried out with the AQ overall T-score as the dependent variable to answer the questions posed at the beginning of the results section.

Question #1 (Were there significant differences between the two groups at pretest?)-A one-way ANOVA was conducted comparing the overall AQ T-score between the groups. There were no statistically significant differences between the two groups at pretest (N=27, F=0.00, P=0.946).

Question #2 (Were there changes over time within each group?)-A 2 factor general linear model ANOVA (due to differences in group sizes) was conducted comparing pretest to posttest AQ scores within each group. There were no statistically significant differences within each group from pretest to posttest from game type (F=0.13, P=0.724) time (F=0.03, P=0.871) or the interaction of the two (F=0.07, P=0.797).

Question #3 (Were there changes between groups upon posttest?)-A one-way ANOVA was conducted comparing the overall AQ T-score between the groups. There were no statistically significant differences between the two groups at posttest (N=27, F=0.19, P=0.667).

Behavioral Measures

Descriptive

In group 1, there was an overall slight decrease in the number of cooperative and competitive responses from pretest to posttest (7.08 to 5.83, and 4.25 to 3.58, respectively), and a corresponding increase in the number of aggressive responses at posttest, which increased from 3.66 out of fifteen at pretest, to 5.58 out of fifteen at posttest (see Table 9).

More interesting were the group differences from pretest to posttest in group 2, the group that played the violent game. Although like group 1, there was a slight decrease in cooperative responding (6.06 to 4.86), the difference in this decrease was made up with a slight increase in both competitive and aggressive responding (5.4 to 5.86 and 3.53 to 4.26, respectively) (see Table 10). This is interesting not because of the size of the changes, which were small, but rather because the increase in the number of aggressive responses from pretest to posttest was actually smaller in the group that played the violent game.

Additionally, though the aggregate totals for each type of decision did not vary much within each group, individual participants did exhibit strikingly large changes in behavior after game play compared to their pretest choices. In particular, participant number 115, in Group 1, chose 13 cooperative responses and two aggressive responses before playing NFS, and chose to cooperate only three times, compete twice, and aggress ten times. Participant number 127 started with 2 cooperative responses, six competitive, and seven aggressive, and changed to a consistent pattern of aggressing, doing so in 14 of the 15 trials, even remarking during the posttest how he was “going to screw him[the opponent] over”. Finally for group one, participant number 151 went from 10 cooperative, 4 competitive, and only one aggressive, to 5 cooperative, 2 competitive, and 8 aggressive (see Table 5).

	Pretest			Posttest		
Participant #	# Coop	# Comp	# Aggr	# Coop	# Comp	# Aggr
110	10	2	3	14	1	0
115	13	0	2	3	2	10
119	5	7	3	4	6	5
127	2	6	7	0	1	14
134	6	7	2	1	11	3
140	3	5	7	0	9	6
141	8	4	3	14	1	0
150	5	5	5	9	2	4
151	10	4	1	5	2	8
182	7	4	4	5	4	6
185	5	4	6	3	1	11
199	11	3	1	12	3	0
Mean	7.08	4.25	3.66	5.83	3.58	5.58

Table 5. Simulation decisions, NFS

In group two, the only participant to noticeably change decision patterns from pretest to posttest was number 235, who went from 6 cooperative, 5 competitive, and 4 aggressive, to 3 cooperative, 2 competitive, and 10 aggressive (see Table 6).

	Pretest			Posttest		
Participant #	# Coop	# Comp	# Aggr	# Coop	# Comp	# Aggr
201	7	4	4	3	5	7
203	5	5	5	5	6	4
206	12	2	1	6	7	2
211	1	9	5	0	10	5
220	3	6	6	3	6	6
223	7	4	4	4	8	3
224	14	1	0	14	1	0
235	6	5	4	3	2	10
255	4	5	6	2	8	5
275	8	6	1	7	6	2
301	5	3	7	4	2	9
303	6	5	4	6	3	6
305	5	5	5	4	6	5
331	6	8	1	11	4	0
399	2	13	0	1	14	0
Mean	6.06	5.4	3.53	4.86	5.86	4.26

Table 6. Simulation decisions, GTA

Note that of these four participants, all but one of them were in the control group who played the nonviolent game, indicating that these individuals may become aroused and more aggressive via any kind of game play activity, not necessarily violent game play. However, all four of them showed minimal physiological changes, with two showing minor heart rate increases, # 151 (HR 60-65) and # 127 (HR 68-71), and two showing minor decreases # 115 (HR 74-70) and # 235 (HR 95-88). Additionally, all four showed minor, nonsignificant decreases in blood pressure, further indicating a lack of physiological arousal.

Examining aggregate data from the two groups shows little differences of interest at posttest (see Figure 11). Both groups decreased similarly in the number of cooperative responses after game play and increased in competitive responses; the only difference

came with how the group that played the nonviolent game actually increased in aggressive responding after game play, whereas the group who played the violent game decreased slightly.

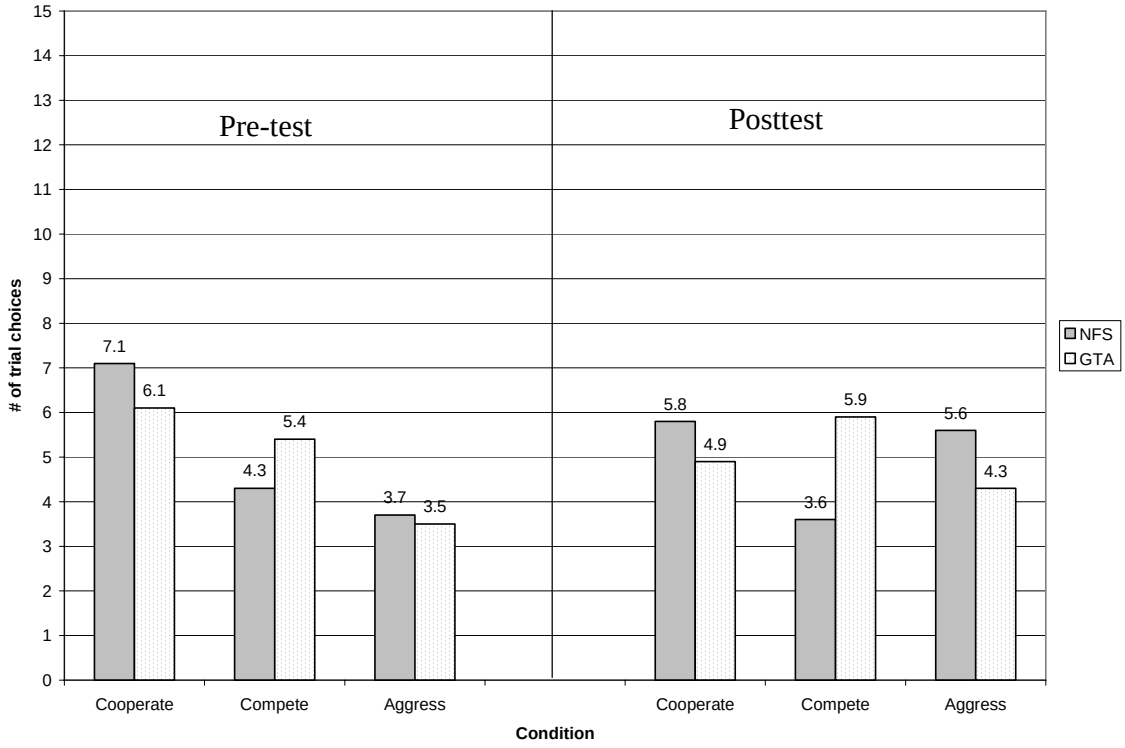

Figure 10. Aggregate simulation decisions, NFS and GTA

Inferential

A series of ANOVAS were carried out with the simulation choices as the dependent variable to answer the questions posed at the beginning of the results section.

Question #1 (Were there significant differences between the two groups at pretest?)-A one-way ANOVA was conducted comparing the number of cooperative simulation choices between the groups at pretest. There were no statistically significant differences between the two groups at pretest (N=27, F=0.60, P=0.446).

A one-way ANOVA was conducted comparing the number of competitive simulation choices between the groups at pretest. There were no statistically significant differences between the two groups at pretest (N=27, F=1.35, P=0.257).

A one-way ANOVA was conducted comparing the number of aggressive simulation choices between the groups at pretest. There were no statistically significant differences between the two groups at pretest (N=27, F=0.02, P=0.880).

Question #2 (Were there changes over time within each group?)-A 2 factor general linear model ANOVA (due to differences in group sizes) was conducted comparing pretest to posttest cooperative, competitive, and aggressive simulation responses within each group. For cooperative responses, there were no statistically significant differences within each group from pretest to posttest from game type (F=0.85, P=0.360) time (F=1.30, P=0.260) or the interaction of the two (F=0.00, P=0.982). For competitive responses, there was a statistically significant effect between game types (F=4.02, P=0.050), but not for time (F=0.04, P=0.840), or the interaction of the two factors (F=0.37, P=0.546). In other words, there was a significant difference in the number of competitive responses between those participants who played the nonviolent game compared to those who played the violent game, that was not solely a function of the passage of time, or playing the game on two separate occasions. For aggressive responses. there were no statistically significant differences within each group from pretest to posttest from game type (F=0.58 P=0.448) time (F=2.61, P=0.113) or the interaction of the two (F=0.37, P=0.545).

Question #3 (Were there changes between groups upon posttest?)-A one-way ANOVA was conducted comparing the number of cooperative simulation choices between the groups at posttest. There were no statistically significant differences between the two groups at posttest (N=27, F=0.32, P=0.575).

A one-way ANOVA was conducted comparing the number of competitive simulation choices between the groups at posttest. There were no statistically significant differences between the two groups at posttest (N=27, F=3.05, P=0.093).

A one-way ANOVA was conducted comparing the number of aggressive simulation choices between the groups at posttest. There were no statistically significant differences between the two groups at posttest (N=27, F=0.79, P=0.383).

The following table summarizes the ANOVAS conducted in analyzing the data, and corresponding F-values (see Table 7, *=p<.05, **=p<01).

ANOVA Question	HR	BP	AQ	Sim-Coop	Sim-Comp	Sim-Aggr
Question # 1 (Pretest diffs b/t groups)	F=0.43	F=1.91	F=0.00	F=0.60	F=1.35	F=0.88
Question # 2 (Changes over time-game type)	F=0.32	F=1.41	F=0.72	F=0.85	**F=4.02***	F=0.58
Question # 2 (Changes over time-time)	F=0.36	F=2.99	F=0.03	F=1.30	F=0.04	F=2.61
Question # 2 (Changes over time-interaction)	F=0.17	F=0.28	F=0.07	F=0.00	F=0.37	F=0.55
Question # 3 (Posttest diffs b/t groups)	F=0.01	F=0.68	F=0.67	F=0.32	F=3.05	F=0.79

Table 7. ANOVA summary and F values

Game Evaluation

The Game Evaluation, without any kind of norm to compare to, is only used as a descriptive tool to determine if the participants playing each of the two games ended up with a similar game experience; if one group played a very fun but violent game, while the other played a very frustrating nonviolent game, it would be difficult to ascertain whether subsequent attitudinal or behavioral changes were due to the violence of the game, or the frustration built into the game. With how important it was that the games were matched on as many variables as possible other than violent content, some subjective measure was needed to validate the experimenter's preliminary game matching. The results of the evaluation demonstrate a moderate degree of effectiveness in matching the overall game experience, as shown in Figure 11.

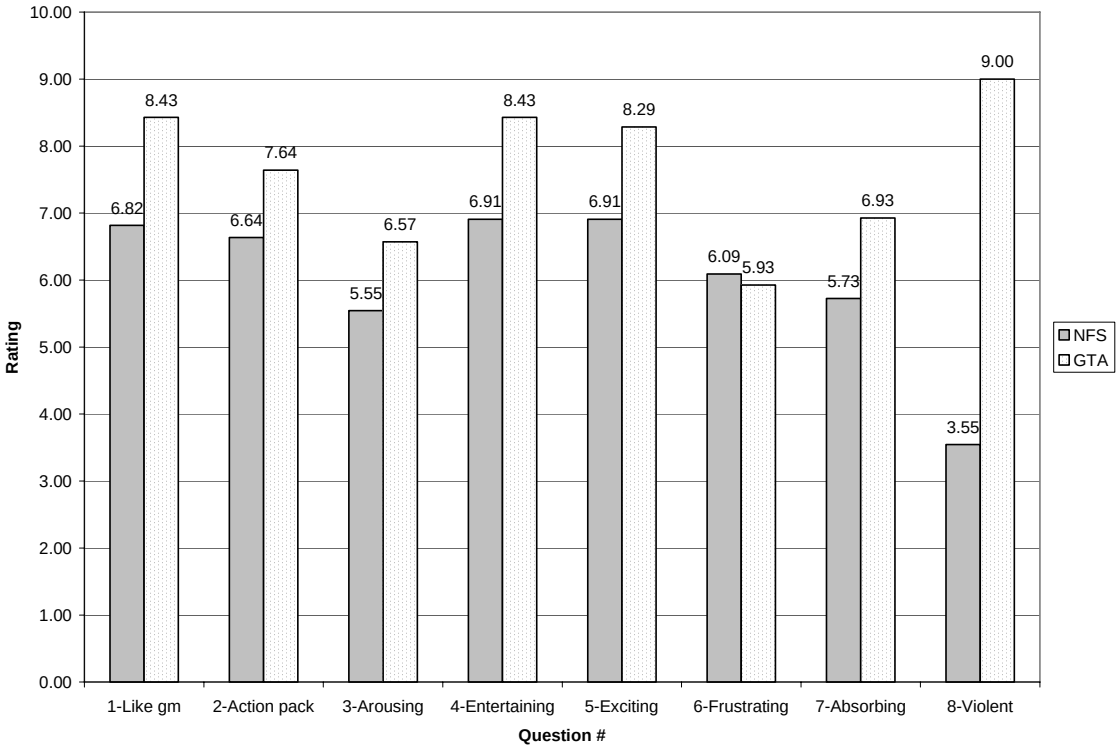

Figure 11. Game evaluation

The largest numerical difference between the groups was on question number eight, “The game was violent,” with means of 3.55 for NFS, and 9.00 for GTA. Despite this large difference, it was somewhat surprising that NFS earned such a high score relative to its actual content, considering the violence in it is very cartoonish and unrealistic, and without any consequences such as car/property damage, etc. Cars bounce off of each other, and signs harmlessly float away and eventually disappear. The majority of the other questions were within a point difference of each other, indicating the games were matched on the other important gameplay dimensions.

An interesting subset of questions on this scale dealt with identification with the main character. Because NFS did not have a main character, it is only possible to

examine the GTA answers on these questions, and therefore visual depiction of these data is not necessary. GTA had only a 2.5 out of 10 on "I am similar to the main character," and a 2.14 on "I would like to be the main character". These scores are significantly lower than responses on any other scale where a higher response indicates higher levels of enjoyment for the game. The low averages on the identification questions cannot therefore be attributed to a lack of realism, lack of enjoyment, or lack of immersion in GTA, especially given that question number seven, "The game was absorbing" was given a 6.93 out of ten. This would seem to cast doubt on a fairly new presumed causal variable on how games affect people, with the degree of violence being correlated with greater character identification, presumably leading to greater modeling, as suggested by Anderson and Dill, (2000). They note, "Thus, the danger in exposure to violent video games seems to be in the ideas they teach and not primarily in the emotions they incite in the player. The more realistic the violence, the more the player identifies with the aggressor."

In order to be thorough, a series of ANOVAS were carried out with questions 1-8 of the game evaluation as the dependent variables to answer question # 3 posed at the beginning of the results section.

Question #3- A one-way ANOVA was conducted comparing the answers on questions # 1-8 between the groups. There were no statistically significant differences between the two groups on questions 1-7, but there was on question # 8 ("The game was violent") ($N=25$, $F=27.40$, $P=0.000$).

Discussion

The most apparent result warranting future research is the fact that despite the many different types of measures, each trying to identify a different potential causal mechanism of aggression, only two of the thirty-two ANOVAS run were statistically significant. One of which, the game evaluation question "The game was violent," was expected to be significant, and shows that the games were successfully matched on key variables other than the amount of violent content. The other significant result, posttest competitive responding on the simulation as a function of violent versus nonviolent game play, is interesting on its own, but not when viewed alongside the substantial number of nonsignificant test results. Additionally, it is worth noting that with the sheer number of ANOVAS run to analyze all the data, 24 in this case excluding the game evaluation ones, it is likely that one or more of them would be significant by chance.

Why then, do other studies seem to indicate more consistently significant interactions between violent game play and aggressive behavior? First, it is possible that some studies found significant results due to the very different nature of the games in terms of how arousing they are to play. As mentioned before, failing to match the games in terms of graphics, difficulty, and other game play variables introduces a confound to the results that cannot be overlooked. Those that do not have this confound and still found results apparently are measuring some kind of change from game play that this study did not, generally in the cognitive (Anderson & Dill, 2000) or attitudinal (Deselms & Altman, 2004) domain. For example, "In essence, the creation and automatization of these aggression-related knowledge structures and the desensitization effects change the

individual's personality" (Anderson & Dill, 2000), which is conceptual speculation that seems premature and not experimentally validated.

One strength of this study lies in the degree of simplicity in its analysis. Ever since the landmark study conducted by Anderson and Dill (2000), the majority of subsequent studies interpret their results along the proposed construct in the study, the General Aggression Model. This model proposes a multifaceted process involving personological and situational variables that influence various related internal states, eventually leading to aggressive behavior (Anderson & Dill, 2000) A more pragmatic conceptual explanation lies in interpreting the results via changes in motivative operations, whereby aggressive game play might make subsequent aggression a more reinforcing behavior, and evoke behavior that in the past had been consequated by opportunities for aggression (Laraway, Snycerski, Michael, & Poling, 2003).

Clearly, it is premature to draw firm conclusions on whether violent games have a short or long term effect on players, or the cognitive, behavioral, or physiological mechanisms that might mediate these effects. Even the most logical sounding effects, such as the negative relationship between play time and grades, needs to be examined further. After all, time spent playing games is only wasted time if it cuts into more functional behavior, such as studying or socializing (Gentile et al., 2004). If a child is playing games instead of getting into trouble on the streets, then this relationship is not as straightforward.

Limitations

Despite the consistent lack of effects found in this study, several limitations still need to be pointed out. Methodologically, a readily discernable limitation to the study, because of its group design, lies in its relatively small sample size (n=27). While this does impose limits on the robustness of certain types of statistical analysis, the fact that the participants were fairly equivalent demographically in their game playing habits, coupled with such consistently nonsignificant results, partially mitigates this concern.

As is the nature of the rapidly advancing videogame industry, by the time the study was concluded, the games used were slightly dated. Primarily, games become dated in their graphics graphics, looking less realistic when compared to newer games. This is not too significant of a problem in this case, because graphically the games were very advanced at the time, and very similar to current popular games in that regard.

The lynchpin to determining behavioral effects is whether participants consistently chose more competitive and/or aggressive responses after playing the violent game; redeemable points were at stake to try and motivate responding, but the fact that the points had to be available twice may have posed a problem. If a participant was already satiated on raffle entries from the pretest trials, there was little to no reason to choose anything other than aggress in the posttest, since the ability of the points to motivate responding through their conditioned reinforcing properties had significantly diminished, leaving the only option, aggress, that involved something other than the player earning points. This may partially or even completely explain the sharp increases in aggressive choices seen in some participants, especially those who played the

nonviolent game, such as #s 127 and 185. It is not clear how this could be remedied while still capturing somewhat natural responding. An additional limitation to the simulation is more of an inherent problem with any simulated measure, that of participant reactivity to the simulation due to its somewhat contrived nature. To the credit of the study, only one participant gave any indication that he suspected the simulation was against an imaginary opponent; among the other 26 participants, many became fairly animated when explaining to me their strategies of outsmarting the "opponent."

It is certainly possible that the simulation is just not an effective measure of aggressive behavior. However, it is similar enough to what was used in a variety of other studies (Anderson & Dill, 2000, Sheese & Graziano, 2005) that it was not deviating from established analog measures of aggression. The only clear way to construct a better simulated measure of aggression would be by building it into the game itself. The scenario that seems the most conducive to doing this would be a "first person shooter" (FPS), such as Doom 3 or Unreal Tournament 2004, where participants could choose to cooperate to defeat the common enemy, or simply shoot each other. Customizing the game to this extent, however, would take considerable expertise, mainly in the area of making the computer control your 'opponent' in a believable enough fashion to fool the participant, and programming of this nature is simply beyond the scope of most researchers.

More conceptual limitations center around the age of participants, and the choice of games in the study. Because of the well researched statistics on exposure to violence, some of which were cited earlier, it could be argued that participants this age have

already been desensitized to the effects of videogame violence; 18-21 year olds were used as a mid-range of sorts with regard to age, in that they were young enough to be considered young adults that are the prime consumer of videogames, yet were old enough to be exposed to the most violently themed games available.

It also bears noting that the scientific community simply does not know how often violent game play increase subsequent aggressive behavior, nor what variables predict an increase in aggressive responding. It could be a unique learning history teaching the individual that violent behavior is an acceptable course of action to resolve conflict, a stable behavior pattern such as an absence of good problem solving skills that don't involve aggression, social contingencies that tolerate aggression or unique provoking conditions (a history of being bullied, ridiculed or otherwise marginalized by peers). Even if aggressive behavior is a statistically rare response to violent video games, the large number of people being exposed to these games suggests that some people will respond with aggression—even if the percentage is low, the absolute number of people responding in this way could present a problem Nonetheless, this study still contributes to our understanding by examining if short term motivation and decision making are altered, even if the sample may have already been desensitized to more long term pervasive effects coming from observing years of violence in the media. With the games, care should have been exercised to select two games that have clearly defined main characters, as this would be another game dimension to match on, and it would provide valuable information about immersion/role adoption and whether violent content alters the degree of immersion.

Future Research

The relative paucity of tightly controlled studies on this topic inevitably means there are many more unanswered questions. For example, longer term, single subject designs examining extended game play sessions as opposed to short discrete trials might illustrate different types and magnitudes of effects. Furthermore, follow up data could be collected on participants who behaved aggressively at the posttest of this study to determine if any long term effects could be seen, although given the frequency of their play each week, one thirty minute session is unlikely to produce much of a change.

The use of simulations, including computer games, to assess aggressive behavior could use further research to assess the validity, sensitivity and reliability of the resulting measures of aggressive behavior. One obvious refinement would be to collect data in a manner that would allow researchers to distinguish between reactive, or provoked aggression, versus proactive, or unprovoked aggression. It is certainly possible that certain types of games, depending on their content and whether they themselves reward unprovoked aggression, evoke different types of aggressive behavior. Studying participants from a wider variety of environmental backgrounds would potentially help determine if effects from violent media are primary, (a sole necessary and sufficient causal variable determining violent behavior), or secondary, (having the potential to determine behavior only if more immediate environmental variables are in place). For example, a study would take two children of identical age, but from much different environments, and see if playing identical games has different effects on their behavior.

Finally, a small amount of research has focused specifically on the female gamer and possible effects from violent video games, but few are methodologically controlled to the extent needed to draw firm conclusions. For example, although one study seems to indicate gender-based differences, it inexplicably uses games over a decade old from when it was published, and again uses a competitive reaction time test as a dependant variable (Anderson & Murphy, 2003). It would be interesting to broaden this body of research, to determine if females are affected differently, and if so, if those differences are due to different social contingencies that determine gender-appropriate behavior.

References

About.com (1997). Can video games kill? Retrieved from <http://vgstrategies.about.com/library/weekly/aa040797.htm>

Anderson, C. A. (2004). An update on the effects of playing violent video games. *Journal of Adolescence, 27*, 113-122.

Anderson, C. A., & Bushman, B. J. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychological Science, 12*, 353-359.

Anderson, C. A., & Dill, K. E. (2000) Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, 78, 772-790.

Anderson, C. A., & Murphy, C. R. (2003). Violent video games and aggressive behavior in young women. *Aggressive Behavior, 29*, 423-429.

Andreasen, M. (2001). Evolution in the family's use of television: An overview. In J. Bryant & J. Bryant (Eds.), *Television and the American Family* (pp. 3-30). New Jersey: Lawrence Erlbaum Associates, Inc.

Associated Press (2005). Illinois bill targets mature video games. Retrieved from <http://www.cnn.com/2005/TECH/fun.games/07/27/illinois.adult.games.ap/index.html>

Buss, A. H., Warren, W. I. (2000). Aggression Questionnaire Manual. Los Angeles: Western Psychological Services.

Cho, I. (2004). Brief history of violence in computer games. Retrieved from <http://wiki.media-culture.org.au/index.php/Computer_Games_-_Brief_History_of_Violence_in_Computer_Games>

Deselms, A. & Altman, J. (2003). Immediate and Prolonged Effects of Videogame Violence. *Journal of Applied Social Psychology*, 33, 1553-1563.

Electronic software association, the. (2004). Digital Pressroom. Retrieved from <http://www.theesa.com/pressroom.html>

Electronic software ratings board (2005). About ESRB: What is the entertainment software ratings board? Retrieved from <http://www.esrb.org/about.asp.>

Funk, J. B., Buchman, D. D., Jenks, J., & Bechtoldt, H. (2003). Playing violent video games, desensitization, and moral evaluation in children. *Applied Developmental Psychology*, 24, 413-436.

Gamespot (2005). Illinois game bill moves on, California bill halted. Retrieved from <http://www.gamespot.com/news/2005/05/04/news_6123598.html.>

Gamespot (2005). No violence or sex for young Tar Heel gamers. Retrieved from <http://www.gamespot.com/news/2005/04/22/news_6122803.html>

Gentile, D. A., Lynch, P. J., Linder, J. R., & Walsh, D. A. (2004). The effects of violent video game habits on adolescent hostility, aggressive behaviors, and school performance. *Journal of Adolescence*, 27, 5-22.

GNC (2005). Heart health: Blood pressure on the rise. Retrieved from <http://www.gnc.com/healthConcernArticle.aspx?id=395&CategoryID=2&lang=en>

Hep, L. (2004). News Wire - Halo 2 day one set to be bigger than Spider Man 2 or Harry

Potter. Retrieved from <http://www.aussiexbox.com.au/template_sec_ games.cfm?page_id=57133837110031005&se_id=149&site_id=11003.>

Hogben, M. (1998). Factors moderating the effect of televised aggression on viewer behavior. *Communication Research*, 25, 220-247.

Huston, A. C., Donnerstein, E., Fairchild, H. H., Feshbach, N. D., Katz, P. A., Murray, J. P., Rubinstein, E. A., Wilcox, B. L., Zuckerman, D. (1992). Big world, small screen: The role of television in American society. Lincoln: University of Nebraska Press.

Laraway, S., Snycerski, S., Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: Some further refinements**.** *Journal of Applied Behavior Analysis*, 36, 407-414.

Lifeclinic (2005). What is blood pressure? Retrieved from http://www.lifeclinic.com/ focus/blood/whatisit.asp

Lindsay, J., & Anderson, C. (2000). From antecedent conditions to violent actions: A general affective aggression model. *Personality & Social Psychology Bulletin*, 26, 533-547.

Mercola, J. (1999). Losing hostility reduces blood pressure. Retrieved from <http://www.mercola.com/1999/archive/hostility_and_blood_pressure.htm>

Paik, H., & Comstock, G. (1994). The effects of television violence on antisocial behavior: A meta-analysis. *Communication Research*, 21, 516-546.

Sheesh, B. E., & Graziano, W. G. (2005) Deciding to Defect: The Effects of Video-Game Violence on Cooperative Behavior. *Psychological Science,* 16, 354-357.

Thorsen, T. (2005). ESRB creates new tween-and-up rating. Retrieved from <http://www.gamespot.com/news/2005/03/02/news_6119608.html.>

Uhlman, E., & Swanson, J. (2004) Exposure to violent video games increases automatic aggressiveness. *Journal of Adolescence*, 27, 41-52.

Varanini, G. (2003). Video games constitutionally protected. Retrieved from <http://www.gamespot.com/news/2003/06/03/news_6029440.html.>

Varanini, G. (2003). Michigan votes for fine on violent video games. Retrieved from <http://www.gamespot.com/news/2003/01/02/news_2907789.html>

Walsh, D., Gentile, D., VanOverbeke, M., & Chasco, E. (2002). MediaWise Video Game Report Card, 2002. Retrieved from <http://www.mediafamily.org/research /report_vgrc_2002-2.shtml#parentguide>

Western Psychological Services (2004). Aggression Questionnaire. Retrieved from <http://www-secure.earthlink.net/www.wpspublish.com/Inetpub4/catalog/W-371.htm>

Winegarner, B. (2005). Game sales hit record highs. <Retrieved from http://www. gamespot.com/news/2005/01/28/news_6117438.html>

Appendix A- Human Subjects Institutional Review Board Approval Letter

WESTERN MICHIGAN UNIVERSITY

Human Subjects Institutional Review Board

Centennial 1903-2003 Celebration

Date: August 3, 2004

To: R. Wayne Fuqua, Principal Investigator
Kent Smallwood, Student Investigator for thesis
Joseph Dagen, Student Investigator

From: Amy Naugle, Ph.D., Interim Chair

Re: HSIRB Project Number: 04-04-10

This letter will serve as confirmation that your research project entitled "Potential Effects of Violent Videogames on Children and Young Adults' Behavior and Physiology" has been **approved** under the **full** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: April 21, 2005

Walwood Hall, Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276

Appendix B-1
Game matching tool-NFS

1. Name of game: Need for Speed: Hot Pursuit 2
2. Platform: PC
3. ESRB Rating: “E” (Everyone)
4. ESRB Content Descriptors: None
5. Game type: Racing
6. Release Date: 10/02
7. Publisher: Electronic Arts
8. Length of time examined: 30 m
9. # of instruction inputs: 4590
10. Instruction inputs/minute: 153
11. # of “cartoon” aggressive behaviors: 35
12. # of “cartoon” aggressive behaviors/minute: 1.16
    a. Description of acts
        i. 27 street signs hit-harmless fly away, no damage
        ii. 8 “crashes” with other cars-simply bounce off each other, no actual damage
13. # of realistic aggressive behaviors: 0
14. # of realistic aggressive behavior/minute: 0
15. Pace-how demanding with reflexes

(slow/medium/fast): fast

16. Game difficulty/complexity (easy/medium/hard): medium

Appendix B-2
Game matching tool-GTA

1. Name of game: Grand Theft Auto 3
2. Platform: PC
3. ESRB Rating: “M” (Mature)
4. ESRB Content Descriptors: Blood, strong language, violence
5. Game type: Crime simulation
6. Release Date: 5/02
7. Publisher: Rockstar Games
8. Length of time examined: 32 m
9. # of instruction inputs: 4183
10. Instruction inputs/minute: 131
11. # of “cartoon” aggressive behaviors: 0
12. # of “cartoon” aggressive behaviors/minute: 0
13. # of realistic aggressive behaviors: 171
14. # of realistic aggressive behavior/minute: 5.34
    a. Description of acts
        i. Carjackings-15
        ii. Murder-Hand to Hand-7
        iii. Murder-Gun-3
        iv. Murder-Vehicular-35
        v. Cars totaled-14

vi. Accidents/property damage-78

vii. Encounters with prostitutes-4

viii. Police murdered-4 (Not previously counted in ii-iv)

ix. Police carjackings-1 (Not previously counted in i)

x. Police murder-2 (Not previously counted in iv)

xi. Assault without murder-3

xii. Assault with gun, without murder-5

15. Pace-how demanding with reflexes (slow/medium/fast)-fast

16. Game difficulty/complexity (easy/medium/hard)-medium

Appendix C-Game playing habits questionnaire

Please answer the following questions honestly and to the best of your ability.
Remember that there are no 'right' or 'wrong' answers

Age_____

1. In a typical week during the school year (7 day period), how much time do you typically spend playing videogames? _____hours/week

2. Have you ever played "Need for Speed: Hot Pursuit 2? Y/N

3. Have you ever played Grand Theft Auto 3? Y/N

4. Please list all games that you remember playing during the past week:

5. How many games did you purchase in the last 12 months? (circle one)
   0 *1-2* *3-5* *5-8* *8-10* *More than 10*

6. What is the main way you decide which games to play? (circle one)
   Game magazines *Friends* *Advertisements in magazines*

   Advertisements on television *Game packaging*

   *Other (please specify)*_____

7. Has a video store or game store ever asked you to see identification before allowing you to buy or rent a game due to its rating? Yes/No

8. If so, what retailer did this occur at?_____

9. 12. Do you spend more time playing games alone or with friends? (circle one)
   Alone With Friends

Appendix D-Video Game Evaluation

Please rate the video game you played on the following dimensions.

	Strongly Disagree								Strongly Agree	
1) I liked the game.	1	2	3	4	5	6	7	8	9	10
2) The game was action-packed	1	2	3	4	5	6	7	8	9	10
3) The game was arousing.	1	2	3	4	5	6	7	8	9	10
4) The game was entertaining.	1	2	3	4	5	6	7	8	9	10
5) The game was exciting.	1	2	3	4	5	6	7	8	9	10
6) The game was frustrating.	1	2	3	4	5	6	7	8	9	10
7) The game was absorbing.	1	2	3	4	5	6	7	8	9	10
8) The game was violent.	1	2	3	4	5	6	7	8	9	10

Please answer the following questions about the main character in the video game (leave blank if the video game you played had no main character).

	Strongly Disagree								Strongly Agree	
9) I really liked the main character.	1	2	3	4	5	6	7	8	9	10
10) I am similar to the main character	1	2	3	4	5	6	7	8	9	10
11) I would like to be the main character.	1	2	3	4	5	6	7	8	9	10
12) I "became" the main character during the game.	1	2	3	4	5	6	7	8	9	10

How often have you played this video game?

- ❑ Never played or saw before today
- ❑ Have seen, but never played before
- ❑ Have played a little
- ❑ Have played a lot

Appendix E-Physiological Data Sheet

Time	Heart Rate (b/m)	Time	Blood pressure
1 m		Pre	
2 m		Post	
3 m			
4 m			
5 m			
6 m			
7 m			
8 m			
9 m			
10 m			
11 m			
12 m			
13 m			
14 m			
15 m			
16 m			
17 m			
18 m			
19 m			
20 m			
21 m			
22 m			
23 m			
24 m			
25 m			
26 m			
27 m			
28 m			
29 m			
30 m			

Game function_____

Appendix-F-Participant Consent Forms

WESTERN MICHIGAN UNIVERSITY
H. S. I. R. B.
Approved for use for one year from this date:

APR 2 1 2005

X_____ HSIRB Chai

Western Michigan University
Department of Psychology
Principal Investigator: R. Wayne Fuqua, Ph.D.
Research Associate: Kent D. Smallwood, B. S.
"The Effects of Video Games on Physiology."

I have been invited to participate in a research project entitled "The Effects of Video Games on Physiology." The purpose of the study is to see if playing video games causes any changes in my heart rate and other measures of how my body functions. I will be given a questionnaire asking about my videogame playing habits and preferences. This is a volunteer activity. I may refuse to complete the questionnaire without any impact on my class grades. My instructor **WILL NOT** be notified about whether I participated or refused to participate in this project; questionnaires will be passed out to all students in the room so that it is impossible to tell who has taken the questionnaire. If I elect to complete the questionnaire, I will answer the questions as honestly as possible. There are not correct or incorrect answers to these questions. Once I am finished with the questions, I am to return the completed questionnaire to the course instructor, who will take the completed questionnaires and give them to the experimenter. The experimenter will privately review my answers, and determine whether I qualify for the second part of this study.

If I qualify for the second part of the study, the experimenter will let me know, and give me details about the activities for the second part of the study by contacting me at the phone number or email address I provided on the questionnaire. I am free to decide whether or not I wish to participate in the second phase of the study if I am eligible. Once I have been contacted by the experimenter and decided whether or not I would like to participate in the remainder of the study, my name will be blacked out by the experimenter, and replaced with a confidential code. The original function of my name on the form was so the experimenter could get in touch with me if I was eligible for the remainder of the study. The master list of names and code numbers will be destroyed once the experiment is complete, making it impossible for anyone to identify my responses.

If I have any questions or concerns about this study, I may contact Dr. Fuqua at 387-4474, or Kent Smallwood at 267-5001. I may also contact the Chair, Human Subjects Institutional Review Board (387-8293) or the Vice President for Research (387-8298) if questions or problems arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

My signature below indicates that I agree to voluntarily participate in the tasks listed on this page, but can stop at any time without penalty.

Print name here_____ _____
Today's Date

Sign name here_____

Assent obtained by:_____ _____
Today's date

22

Appendix F-Participant Consent Forms

Western Michigan University
Department of Psychology
Principal Investigator: R. Wayne Fuqua, Ph.D.
Research Associate: Kent D. Smallwood, B. S.
"The Effects of Video Games on Physiology"

I have been invited to participate in a research project entitled "The Effects of Video Games on Physiology." The purpose of the study is to see if playing video games causes any change in my heart rate and other measures of how my body functions.

I am being invited to the second phase of this study because I am eligible from my answers on the previous questionnaire. Again, this is a volunteer activity. If I do not wish to participate in this portion of the study, I can tell the experimenter and I will be allowed to leave without any questions or any impact on my grades. Even if I agree to participate by signing this form, I can change my mind at any time when testing begins or at any time during testing.

Experimenters will not reveal any information about my performance in this experiment to my course instructor. If my course instructor for some reason requested information about whether I participated in the experiment on a particular day, experimenters would answer those questions accurately, with no added information.

If I agree to participate, my first task will be to play a game in which I will have the opportunity to earn points that can be redeemed after the study is complete for entries in a raffle for one of two $50 gift certificates to Target. This part of the experiment will take approximately 10-15 minutes.

After this part of the experiment, I will be asked to play a different video game for approximately 30 minutes. I understand that this game may contain graphic violence, and/or mildly sexually suggestive themes. Experimenters will give me instructions on the basics of how to play the video game and then, once I verbally inform the experimenter that I understand how the game is played, I will have the opportunity to play the game on my own. During this time, experimenters will monitor my heart rate via a unit attached to my chest that transmits to a nearby watch device. Experimenters will also record my blood pressure at one minute intervals during game play by using a small blood pressure cuff. In the event that my heart rate rises to abnormal levels, the experimenter will immediately stop the experiment. In addition, if playing the video game makes me very uncomfortable, afraid, or upset, I may stop playing without penalty. While I am playing the video game, the experimenter will remain in the room to monitor my heart rate and to answer any questions that I might have about how to play the video game.

In accordance with the warnings printed in the instruction manual of every video game currently produced, risks of playing video games may include seizures and/or repetitive motion injuries. Seizures caused by playing videogames are incredibly rare (About.com, 2002). While the risks of participating in this study are likely minimal, there is a possibility that playing videogames with violent content may result in an increase in aggressive behavior. However, researchers anticipate that, even if a possible link between playing aggressive video games and aggression is discovered, this will most

Appendix F-Participant Consent Forms

"The Effects of Video Games on Physiology."
Principal Investigator: R. Wayne Fuqua, Ph.D.
Research Associate: Kent D. Smallwood, B. S.

likely be a short-term effect. I may also experience some discomfort or frustration in playing a game that is unfamiliar to me. My agreement to participate in the study means that I acknowledge the possibility of these risks.

After playing the game, I will play the point-earning simulation again. This second session will be exactly like the first one and points that I earned previously will carry over to this session. I will then be able to exchange my total number of points for entries into the previously mentioned raffle.

Finally, after I have completed the simulation, I will complete two final questionnaires after which the experiment will be completed. It is expected that the entire experiment will take 75 minutes, at which time I will receive $5 in cash for my participation.

My name will not appear on this questionnaire, instead using an anonymous code number to represent my data. The master list of names and code numbers will be destroyed once the experiment is complete, making it impossible for anyone to identify my responses.

If I have any questions or concerns about this study, I may contact Dr. Fuqua at 387-4474, or Kent Smallwood at 267-5001. The participant may also contact the Chair, Human Subjects Institutional Review Board (387-8293) or the Vice President for Research (387-8298) if questions or problems arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

My signature below indicates that I agree to voluntarily participate in the tasks described in this form, but can stop at any time without penalty.

_____
Print name here

_____ _____
Sign name here Today's Date

Assent obtained by:

_____ _____
Initials of researcher Today's date

Appendix G-Summary of potential participant data

Age-Non-Participants		Age-Participants	
Mean	18.94	Mean	18.96
Standard Error	0.17	Standard Error	0.20
Median	19.00	Median	19.00
Mode	18.00	Mode	19.00
Standard Deviation	2.36	Standard Deviation	1.02

Descriptive Data of Age of Sample

Hours/week-Non-Participants		Hours/week-Participants	
Mean	10.63	Mean	4.39
Standard Error	0.64	Standard Error	0.68
Median	8.50	Median	3.75
Mode	10.00	Mode	0.50
Standard Deviation	8.97	Standard Deviation	3.49

Descriptive Data of Time Spent Playing Video Games